

A FLORA OF CALIFORNIA

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ILLUSTRATED WITH MANY ORIGINAL FIGURES

PART IV

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stipules. Flowers perfect and pistillate in axillary clusters, involucre by small leafy bracts. Staminate calyx 4-parted. Pistillate calyx tubular-ventricose, 4-lobed. Achene ovoid, enclosed by the persistent calyx.—All continents, 7 species. (The ancient Latin name of the Italian species because growing on walls.)

1. *P. debilis* Forst. Stems very slender, several from the base, diffuse, 4 to 10 inches long; herbage pilose or hispid; leaves ovate to ovate-lanceolate, rounded at base or abruptly cuneate, often shortly attenuate to the obtuse apex, 3 to 12 lines long, or the lowest very small, on petioles 1 to 3 lines long; clusters few-flowered.

Moist shady places: Southern California and north to Inyo Co. North and South America, Asia, Australia.

Locs.—San Diego; Witch Creek, *Alderson*; Palm Cañon, *Jepson* 1365, *Hall* 1882; Menifee, *Alice King*; San Bernardino, *Parish*; Arrowhead Sprs., *Setchell*; San Gabriel Mts., acc. *McClatchie*; Redondo, *Braunton* 345; Santa Cruz Island, *Brandeggee*; Santa Barbara, acc. *Yates*.

Ref.—*PARIETARIA DEBILIS* Forst. Prodr. 73 (1786), type loc. New Zealand.

PLATANACEAE. PLANE FAMILY.

Large deciduous trees with alternate ample palmately lobed leaves and sheathing stipules; dilated base of petiole enclosing the bud of the next season; bark falling away in thin plates. Flowers monoecious, the staminate and the pistillate on separate axes, closely packed in separate ball-like clusters distributed at intervals along a terminal very slender axis, the inflorescence thus appearing moniliform. Receptacles very hairy and individual flowers difficult to segregate. Calyx and corolla none. Stamens with long anthers and very short filaments densely crowded on a globose fleshy receptacle. Pistils with interspersed clavate truncate bracts, crowded on a similar receptacle; ovary 1-ovuled; style one, filiform, laterally stigmatic. Fruit a coriaceous nutlet with tawny hairs about the base.

Bibliog.—Griggs, R. F., Characters and Relationships of the Platanaceae (Bull. Torr. Club, 36: 389-395,—1909).

1. *PLATANUS* L. PLANE TREE.

The only genus.—Northern hemisphere, 5 species. (Greek *platus*, broad, referring to the ample leaves.)

1. *P. racemosa* Nutt. WESTERN SYCAMORE. (Fig. 66.) Tree 40 to 90 feet high with a massive crown of wide-spreading limbs; leaves $3\frac{1}{2}$ to 9 (or 13) inches long, commonly broader than long, parted into 3 to 5 broad, spreading fingers or lobes; margin entire or with few small teeth; stipules very conspicuous when full grown, roundish or angular in outline and encircling or sheathing the stem; ball-like flower clusters, 2 to 7 in number, distributed at intervals along a pendulous and very slender axis borne at or near the end of a branch; balls falling to pieces in the winter, releasing the seed-like nutlets.

Common and sometimes abundant in river-bottoms. Sacramento Valley southward through the Sierra Nevada foothills, the San Joaquin Valley and South Coast Ranges to the coast region of Southern California. Lower California. Individual trees frequently attain great size. The trunks are often remarkable for their great divergence from the perpendicular, due to the shifting character of the soil in stream beds. Not known in North Coast Ranges. Northernmost station at Anderson, Tehama Co.

Refs.—*PLATANUS RACEMOSA* Nutt. Sylva, 1: 47, t. 15 (1842); *Jepson*, Fl. W. Mid. Cal. 275 (1901), Silva Cal. 247 (1910).



Fig. 66. *PLATANUS RACEMOSA* Nutt. *A*, fruiting branchlet, $\times \frac{1}{3}$; *a*, pistil, $\times 12$; *b*, stamen, $\times 12$; *c*, staminate inflorescence, $\times 1$; *d*, pistillate inflorescence, $\times 1$.

LORANTHACEAE. MISTLETOE FAMILY.

Evergreen plants, parasitic on trees. Branches dichotomous. Leaves opposite, simple and entire, or often reduced to connate scales. Flowers dioecious (in ours), greenish and inconspicuous, regular, apetalous. Calyx 2 to 5-lobed. Stamens as many as the calyx-lobes and inserted upon them; anthers 1 or 2-celled. Ovary inferior, 1-celled. Fruit a berry with glutinous endocarp. Embryo straight, in copious endosperm.—All continents, mostly tropical, 21 genera and 550 species.

Bibliog.—Engelmann, Geo., Papers on Loranthaceae (Collected Works, 488-495,—1887). Cannon, W. A., Anatomy of *Phoradendron villosum* (Bull. Torr. Club, 28: 374-390,—1901); Observations on the Germination of *Phoradendron villosum* and *P. californicum* (l. c. 31: 435-443,—1904). York, H. H., Anatomy and Biological Aspects of *Phoradendron flavescens* (Univ. Tex. Bull. 120,—1909). Bray, W. L., The Mistletoe Pest in the Southwest (Bur. Pl. Ind. Bull. 166,—1910). Blumer, J. C., Mistletoe in the Southwest (Pl. World, 10: 240-246,—1910). Meinecke, E. P., Parasitism of *Phoradendron juniperinum libocedri* (Proc. Soc. Am. For. 7: 35-41,—1912).

Berry sessile; flowers globose; leaves foliaceous or scale-like.....1. PHORADENDRON.
 Berry on a recurved pedicel; flowers mostly compressed; leaves scale-like and connate.....2. ARCEUTHOBIMUM.

1. PHORADENDRON Nutt. MISTLETOE.

Parasitic on mostly deciduous trees, the stems much branched and swollen at the nodes. Leaves foliaceous and coriaceous, or scale-like. Flowers sunk in the joints of the jointed spikes, usually several to each scale. Staminate calyx commonly 3-lobed, the anthers 2-celled, sessile on the base of the lobes. Pistillate calyx adherent to the ovary, the 3 teeth persistent on the globose semitransparent mucilaginous sessile berry.—North and South America, mostly tropical, 80 species. (Greek phor, a thief, and dendron, a tree.)

Leaves foliaceous; spikes many-flowered; anthers transverse, opening by pores.

Leaves elliptic to oblong, 3 or 5-nerved.

Herbage yellowish1. *P. flavescens*.

Herbage greenish2. *P. villosum*.

Leaves narrowly oblong or spatulate, nerveless.....3. *P. bolleanum*.

Leaves reduced to short scales; spikes few-flowered.

Anthers oblong, opening by longitudinal slits.....4. *P. californicum*.

Anthers transverse, opening by pores.....5. *P. juniperinum*.

1. *P. flavescens* Nutt. var. *macrophyllum* Engelm. YELLOW MISTLETOE.

Foliage yellowish green; leaves orbicular to ovate or narrowly elliptic, obtuse, $3\frac{1}{2}$ inches long or less, conspicuously 5-nerved from the base and distinctly petioled; fruiting spikes dense, $1\frac{1}{2}$ inches long or less; berries white, 2 lines in diameter.

Sacramento and San Joaquin valleys to Southern California and east to Texas. Parasitic on various soft-wood trees: on *Aesculus californica* (the haustoria spread in the bark and by buds give rise to a twiggy growth); on *Populus fremonti* (the trees are frequently killed by the parasite); also occurs on various willows. Stems 1 to 5 feet long, forming a large woody shrub.

Refs.—PHORADENDRON FLAVESCENS Nutt. Jour. Acad. Phila. ser. 2, 1: 185 (1848) by implication, the type spm. from Texas. Var. MACROPHYLLUM Engelm. Bot. Wheeler, 252 (1878), type spms. from the Gila and Bonita rivers.

2. *P. villosum* Nutt. COMMON MISTLETOE. Foliage deep green; leaves elliptic, obtuse, 3-nerved, $\frac{1}{2}$ to 1 inch long, on short petioles; berries pinkish, $1\frac{1}{2}$ lines in diameter.

Coast Range and Sierra Nevada foothills; Southern California. Arizona to Oregon. Parasitic chiefly on oaks, observed on the following species: *Quercus douglasii*, *lobata*, *wislizenii*, *kelloggii*, and *chrysolepis*, and *Umbellularia californica*. Stems woody, forming shrubs 1 to 6 feet in diameter.

Refs.—PHORADENDRON VILLOSUM Nutt. Jour. Acad. Phila. ser. 2, 1: 185 (1848) by implication; Engelm. in Gray, Jour. Bost. Soc. Nat. Hist. 6: 212 (1850), type loc. Willamette woods, Ore.

3. *P. bolleanum* Eichler. Stems $\frac{1}{2}$ to $\frac{3}{4}$ foot long, thickly branched; leaves narrowly oblong or spatulate, obtuse, contracted to a short petiole, $\frac{1}{2}$ to 1 inch long; bracts ciliolate; spikes short, mostly less than $\frac{1}{4}$ inch long, opposite or in 4s; berries pearl-like on account of their whiteness, translucency and luster, rather less than 2 lines in diameter.

Coast Ranges and Sierra Nevada, through the Mohave Desert to Southern California. South into Mexico.

Locs.—Hornbrook, Siskiyou Co., Copeland 3542, on *Juniperus*; Middletown, Jepson, on *Cupressus macnabiana*; Mt. Tamalpais, Eastwood, on *Cupressus sargentii*; Santa Monica, Barber 205; Leonis Valley, Davy 2603, on *Juniperus*. Common in the tops of *Abies concolor* between Yosemite and Mariposa Big Trees, often finally killing the terminal part (four to six feet) of the axis.

Refs.—PHORADENDRON BOLLEANUM Eichler, in Mart. Fl. Bras. 5²: 134m (1868); Jepson, Fl. W. Mid. Cal. 366 (1901). *Viscum bolleanum* Seem. Bot. Herald, 295, t. 63 (1856), type loc. Sierra Madre, Mexico.

4. *P. californicum* Nutt. Stems slender, terete, hanging or pendulous from the host; herbage pubescent or finally glabrous; scales broadly ovate, acute, spreading; staminate spikes consisting of 2 or 3 (or 5) flower-bearing joints, each with 2 to 6 flowers; anthers oblong, the cells opening by a longitudinal slit; pistillate spikes sometimes with nearly as many joints and flowers as the staminate; joints in fruit elongated (2 to 12 lines long); berries red, 2 lines in diameter.

Southern California along the Colorado River and in the Colorado Desert. Arizona. Parasitic on *Prosopis juliflora* and pubescens, *Larrea mexicana*, *Acacia greggii*, etc.

Locs.—Imperial, *Roadhouse*; Indio, *Davy* 45; Mecca, *Mary McKibben*; Cottonwood Sprs., *Hall* 6014; Mellen, Colorado River, *Jepson* 5195.

Ref.—PHORADENDRON JUNIPERINUM Nutt. Jour. Acad. Phila. ser. 2, 1: 185 (1848), type loc. Southern California, *Gambel*, parasitic on *Prosopis pubescens*.

5. *P. juniperinum* Engelm. Stems stout, terete, in erect tufts, 6 to 12 inches high, the ultimate branchlets 4-sided; scales low-triangular, ciliate, distinct or connate; staminate spikes consisting of 1 (rarely 2) very short joints; joints 6 to 8-flowered; anthers tranverse, opening by pores; pistillate spikes 2-flowered; berry whitish or light red, $1\frac{1}{2}$ lines in diameter.

Sierra Nevada, on *Juniperus*. East to New Mexico.

Var. *libocedri* Engelm. Branches longer and more slender; joints more elongated.—Sierra Nevada south to the San Bernardino and San Jacinto mountains, on *Libocedrus decurrens*.

Refs.—PHORADENDRON JUNIPERINUM Engelm. Mem. Am. Acad. ser. 2, 4: 58 (1849), type loc. Santa Fe. Var. LIBOCEDRI Engelm. Bot. Cal. 2: 105 (1880), type Californian.

2. ARCEUTHOBIUM Marsch-Bieb. PINE MISTLETOE.

Plants yellow or brown, leafless, fragile-jointed, parasitic on coniferous trees. Stems quadrangular or angled. Leaves reduced to connate scales. Flowers solitary or several in each axil, crowded into apparent spikes, opening in autumn. Staminate flower:—calyx mostly 3-parted, compressed; stamens 3, the anthers sessile near the center of the calyx-lobes, roundish, 1-celled, opening by a circular slit. Pistillate flower:—calyx 2-cleft, the teeth laterally disposed, the ovary ripening the next autumn after flowering and exerted on the recurved pedicel. Berry circumscissile near the base, when fully ripe explosively dehiscent at a touch or when teased, the glutinous seed being expelled to a distance of several feet.—Northern hemisphere, 10 species. (Greek *arkeuthos*, juniper, and *bios*, life.)

Staminate flowers on peduncle-like joints in a paniculate cluster.....1. *A. americanum*.
Staminate flowers in the axils of the scales of a simple or compound spike.

Host-plant *Pseudotsuga*2. *A. douglasii*.
Host-plant *Pinus* species.

Staminate plants yellow, pistillate ones brown.....3. *A. campylopodum*.
Staminate and pistillate plants of the same color or nearly.

Branches erect; staminate flowers many.....4. *A. cryptopodum*.

Branches divaricate; staminate flowers often few.....5. *A. divaricatum*.

1. *A. americanum* Nutt. Plants greenish yellow, dichotomously or verticillately much branched; staminate flowers nearly all terminal on distinct peduncle-like joints.

Sierra Nevada from the Yosemite region northward to British Columbia and east to the Rocky Mts. On *Pinus murrayana*.

Locs.—N. Fork Kings River, *Hall & Chandler* 426; Little Yosemite Valley, *Bolander* 5095.

Refs.—ARCEUTHOBIUM AMERICANUM Nutt.; Engelm. in Gray, Jour. Bost. Soc. Nat. Hist. 6: 214 (1850), type from Oregon, *Nuttall*. *Razoumofskyia americana* Kuntze, Rev. Gen. Pl. 2: 587 (1891).

2. *A. douglasii* Engelm. Small, the stems suberect, $\frac{1}{4}$ to 1 inch high; flowers in short usually 5-flowered spikes; berry $2\frac{1}{2}$ lines long.

Northern Sierra Nevada and north to Idaho; east to New Mexico. On *Pseudotsuga taxifolia*.

Locs.—Sierra Valley acc. Bot. Cal. 2: 106; Mt. Shasta, *Hall & Babcock* 4078.

Var. *abietinum* Engelm. Larger, the stems 1 to 5 inches long.—Bear Valley, Nevada Co., on *Abies concolor*; northward to Washington.

Refs.—*ARCEUTHOBium DOUGLASII* Engelm. Bot. Wheeler, 253 (1878), type spms. from the Southwest. *Razoumofskyia douglasii* Kuntze, Rev. Gen. Pl. 2: 587 (1891). Var. *ABIETINUM* Engelm. in Bot. Cal. 2: 106 (1880), type loc. Sierra Valley, *Lemmon*.

3. *A. campylopodum* Engelm. Stems dichotomously branched, 4 to 15 inches long, the branches bearing numerous spikes, the lower spikes commonly with accessory spikes in the axils; staminate plants deep yellow, their spikes dense, $\frac{1}{2}$ to $\frac{3}{4}$ inch long; pistillate plants olive-brown, their spikes $\frac{1}{4}$ to 1 inch long, paniculate; berries brown, oblong-elliptic, 2 to $2\frac{1}{2}$ lines long.

Southern California; Coast Ranges and Sierra Nevada. North to British Columbia. On *Pinus*.

Locs.—Hamburg, Siskiyou Co., *Butler* 1070, on *Pinus ponderosa*; Russian Creek, Siskiyou Co., *Butler* 273, on *P. tuberculata*; Sisson, *Jepson*, on *P. ponderosa*; Elk Mt., Lake Co., *Tracy* 2355, on *P. ponderosa*; Samuel's Sprs., Napa Co., *Jepson*, on *P. sabiniana*; Mt. St. Helena, *Jepson*, on *P. tuberculata*; Conn Valley, Napa Range, *Jepson*, on *P. ponderosa*; Mt. Diablo, *Jepson*, on *P. sabiniana*; Mt. Hamilton, *Chandler* 6022, on *P. sabiniana*; San Bernardino Mts., *Parish*, on *P. coulteri*; Mt. San Jacinto, *Hall* 2566, on *P. lambertiana*, 2616, on *P. ponderosa*; Bower Cave, *Jepson*, on *P. ponderosa*; Snow Creek, Yosemite, *Hall*, on *P. jeffreyi*.

Refs.—*ARCEUTHOBium CAMPYLOPODUM* Engelm. Jour. Bost. Soc. Nat. Hist. 6: 214 (1850), type loc. vicinity northern Idaho, *Geyer*. *A. occidentale* Engelm. in Bot. Cal. 2: 107 (1880). *Razoumofskyia occidentale* Kuntze, Rev. Gen. Pl. 2: 587 (1891); *Jepson*, Fl. W. Mid. Cal. 366 (1901).

4. *A. cryptopodum* Engelm. Stout, 2 to 4 inches high, brownish yellow or olive-brown; staminate plants smaller than the pistillate; staminate spikes with buds flattened against the spikes; anthers attached above the middle of the lobes.

Colorado and New Mexico to Arizona. Mineral King and Soda Sprs., southern Sierra Nevada, acc. *Coville* (Contrib. U. S. Nat. Herb. 4: 192). On *Pinus ponderosa*.

Refs.—*ARCEUTHOBium CRYPTOPODUM* Engelm. in Gray, Jour. Bost. Soc. Nat. Hist. 6: 214 (1850), type loc. Sante Fe, *Fendler* 283. *A. robustum* Engelm. Bot. Wheeler, 254 (1878).

5. *A. divaricatum* Engelm. Stout, 2 to 4 inches high, branches divaricately spreading, often flexuous or recurved; staminate flowers few and scattered; pistillate spikes often with sterile ones behind them in the same axils; berry $1\frac{1}{2}$ to $1\frac{3}{4}$ lines long.

Providence Mts., *Brandegee*. East to Utah and New Mexico. On *Pinus monophylla*.

Ref.—*ARCEUTHOBium DIVARICATUM* Engelm. in Bot. Wheeler, 253 (1878), type spms. from the Southwest.

SANTALACEAE. SANDALWOOD FAMILY.

Herbs or shrubs, usually root parasites. Leaves simple, entire. Flowers small, in ours perfect, mostly greenish. Corolla none. Calyx valvate, 4 or 5-cleft, the lower part of the tube adherent to the ovary. Stamens 3 to 6, inserted opposite the calyx lobes and between the lobes of the disk. Ovary 1-celled; style one; stigma capitate; ovules 2 to 4, suspended from the top of a free central placenta. Fruit indehiscent, nut-like, 1-seeded. Seeds without testa. Embryo small, axile at one end of the abundant endosperm.—Tropical or a few in the temperate zones, 26 genera and 250 species.

1. *COMANDRA* Nutt. BASTARD TOAD-FLAX.

Perennial herbs with rootstocks, striate stems and glabrous herbage. Leaves alternate, nearly sessile, the lowest scale-like. Flowers greenish white, in small terminal or axillary cymose clusters. Calyx campanulate or urnshaped,

5-cleft. Anthers borne on filaments and also attached to calyx-lobes by a tuft of thread-like hairs. Placenta filiform, contorted. Fruit nut-like, crowned by the persistent calyx-lobes, the cavity filled by a globular seed.—North America and Europe, 5 species. (Greek kome, hair, and ander, man, referring to the hairy appendages of the stamens.)

1. *C. umbellata* Nutt. Stems many from a somewhat woody base, 5 to 12 inches high; leaves green or pallid, oblong, acute at base and apex, $\frac{1}{2}$ to 1 inch long, shortly petioled; flowers $2\frac{1}{2}$ lines long; fruit globose, the size of a pea, the persistent calyx-lobes forming a sort of neck.

Sierra Nevada, commonly between 5000 and 6000 feet. North to British Columbia and east to the Atlantic. July-Aug. Parasitic on the roots of shrubs.

Loes.—Mineral King, *Hall & Babcock* 5694; Old Colony Mill, Sequoia Park, *Jepson* 633 (flowers occasionally 6-merous); Alta Peak, *Hopping* 80; Merced Big Trees, *Jepson*; Pine Ridge, Fresno Co., *Hall & Chandler* 73; Clinton, Amador Co., *Hansen* 540; Jackson, Amador Co., *Hansen*; Goose Valley, Shasta Co., *Baker & Nutting*; Goosenest Mt., *Butler* 1069; Spring Camp, Shasta Co., *Misses Jones & Alexander*; Sisson, *Setchell & Dobie*. Narrow-leaved non-glaucous specimens which seem intermediate between *C. umbellata* and *C. pallida* are as follows: S. Fork Kaweah River, *Culbertson* 4479; Alta Mdws., *Grant* 1309; Yosemite Trail, *Brewer* 1629; Siskiyou Co., *Bradley*.

Refs.—*COMANDRA UMBELLATA* Nutt. Gen. 1: 157 (1818). *Thesium umbellatum* L. Sp. Pl. 208 (1753), type spms. from Va. and Penn.

C. PALLIDA A. DC. Prodr. 14: 636 (1857), type loc. Clearwater, Idaho, *Spalding*. Herb-age paler or glaucous; leaves linear-lanceolate; fruit ovoid.—Ore., Wash. and eastward. Coville cites it as occurring at Mineral King (Contrib. U. S. Nat. Herb. 4: 194), but we are unable to refer definitely any Californian specimen to this species since our material of *Comandra* does not seem to separate into two consistent units.

ARISTOLOCHIACEAE. BIRTHWORT FAMILY.

Perennial herbs or twining shrubs. Leaves simple, alternate, petioled, cordate. Flowers perfect, apetalous, with a petal-like synsepalous 3-lobed calyx. Stamens 6 to 12 with extrorse anthers. Styles 6 or 1. Ovary inferior, 6-celled. Fruit a fleshy or dry capsule. Seeds in 1 or 2 rows on the inner angle of each cell, with a minute embryo in copious endosperm.—Five genera and about 200 species, tropic and warm temperate regions of all continents.

Calyx regular, persistent; capsule irregularly dehiscent.....1. *ASARUM*.
Calyx irregular, deciduous; capsule septicidally dehiscent.....2. *ARISTOLOCHIA*.

1. *ASARUM* L.

Nearly acaulescent herbs with fragrant slender creeping rootstocks bearing 2 or 3 scale-like bracts, then 1 or 2 reniform or cordate leaves on long closely approximate petioles and a short-peduncled flower close to the ground in the axil of the lower leaf. Calyx regular, campanulate, the limb 3-parted, the lobes spreading or recurved. Stamens 12, nearly free from the styles, at first reflexed, the alternate ones shorter; filaments more or less distinct, the connective usually continued beyond the anther into a point. Styles 6, more or less united. Capsule globose, fleshy, commonly bursting irregularly. Seeds large, thick, 2 rows in each cell.—North temperate zone, 15 species. (Derivation obscure.)

Rootstock stolon-like, remotely scaly; styles united, equaling the stamens.

Calyx-lobes 1 inch long or more1. *A. caudatum*.

Calyx-lobes 4 to 6 lines long2. *A. lemmoni*.

Rootstock rather closely scaly; styles nearly distinct.....3. *A. hartwegi*.

1. *A. caudatum* Lindl. WILD GINGER. Evergreen herb; leaves cordate-reniform, shortly acute or obtusish, pubescent below and above on the veins, 2 to 6 inches broad, on petioles 3 to 7 inches long; peduncles 6 to 12 lines long; calyx-lobes triangular or oblong, attenuate into a tail which is 1 to $2\frac{1}{4}$ inches

long; filaments stout, the free apex of the connective much shorter than the anther; styles united, equaling the stamens.

Deep shade of Coast Range woods, in California following rather closely the Redwood Belt from the Santa Cruz Mts. northward. Extends north to British Columbia.

Locs.—Coffee Creek, Salmon Mts., *Hall* 8532; Trinity Summit, *Goddard* 117; Eureka, *Tracy* 794; Sherwood Valley, *Davy & Blasdale* 5168; Mendocino City, *Bolander* 4785; Stewart's Pt., *M. S. Baker*; Howell Mt., *Jepson*; Olema, *Jepson*; Moraga Valley, *Davy*; San Leandro Creek, *Chandler* 869; Pescadero Creek, San Mateo Co., *Copeland*; Santa Cruz, *Eastwood*. Probably occurs in the Redwoods of the Santa Lucia Mts.

Refs.—*ASARUM CAUDATUM* Lindl. Bot. Reg. sub. t. 1399 (1831), type loc. Fort Vancouver, Wash., *Douglas*; *Jepson*, Fl. W. Mid. Cal. 363 (1901).

2. **A. lemmoni** Wats. Leaves thin, rounded at summit; flowers mostly glabrous; calyx-lobes only 4 to 6 lines long, obtuse or acute; connective only slightly produced beyond the anther.

Northern Sierra Nevada; Plumas and Sierra cos.

Locs.—Brush Creek, Butte Co., *Kate Conger*; Downieville, *Eva Kennedy* 20; Placer Co., *Hardy*; Merced Grove, *Hall & Babcock* 3413; Alta Mtns., *Hopping* 513; Fortman Mt., *Mari-posa Co., Congdon*.

Refs.—*ASARUM LEMMONI* Wats. Proc. Am. Acad. 14: 294 (1879), the type spms. from Plumas Co., *R. M. Austin*, and Sierra Co., *Lemmon*.

3. **A. hartwegi** Wats. Rootstock rather closely scaly; leaves 2 to 5 inches broad, strikingly mottled, pubescent below, glabrous above or sometimes pubescent along the lateral veins; flowers on pedicels $\frac{1}{2}$ inch long; calyx long, hairy outside, the tube 6 to 8 lines long, the lanceolate attenuate lobes twice as long; connective as long or twice as long as anther.

Sierra Nevada, 4000 to 7000 feet; also in Trinity Co. North to the Cascade Mts., Oregon.

Locs.—N. Fork Middle Tule River, *Hall* 8354; Marble Fork Kaweah River, *Hopping* 301; Cedar Creek, Sequoia Park, *Jepson* 617; Merced River, *Hall* 8850; Bower Cave, *Congdon*; Clinton, Amador Co., *Hansen*; Camino, El Dorado Co., *K. Brandegee*; Burney Valley, Shasta Co., *Baker & Nutting*; Trinity Divide, Shasta Co., *Blasdale*; Sisson, *Jepson*; Shasta Sprs., *Heller* 7989; Russian Creek, Siskiyou Co., *Butler* 143; Hupa Valley, *Davy* 5734; New River, Trinity Co., *Jepson* 1986.

Ref.—*ASARUM HARTWEGI* Wats. Proc. Am. Acad. 10: 346 (1875), type loc. middle Sierra Nevada.

2. **ARISTOLOCHIA** L. PIPE VINE.

Twining shrubs with sparingly branched stems and axillary pendulous flowers. Calyx tubular, strongly curved and pipe-shaped. Anthers 6, rarely 7 or 8, sessile, disposed in pairs and adnate to the short simple style. Stigma 3 to 6-lobed or -angled. Capsule 6-angled and 6-valved, septicidally dehiscent. Seeds horizontal, in one row in each cell, numerous.—About 180 species, tropic and temperate regions. (Greek *aristos*, best, *locheia*, parturition, from its supposed efficacy in child-birth.)

1. **A. californica** Torr. DUTCHMAN'S PIPE. Deciduous woody climber, twining 5 to 12 feet high on shrubs, the herbage more or less pubescent, sometimes silky; leaves ovate, cordate, $1\frac{1}{2}$ to 3 (or $5\frac{1}{2}$) inches long, on petioles 1 or 2 inches long or less; pedicels $\frac{3}{4}$ inch long, with a bract at the middle; calyx greenish, veined with purple, $1\frac{1}{8}$ to $1\frac{1}{2}$ inches long; inside of tube near the base with a broad dull purple band; limb 2-lipped, the upper of 2 broad obtuse lobes, the lower entire, all lined with a disk-like thickening which on the upper side is continued downward and at the angle forms a projection partially closing the tube; ovary clavate; stigma with 3 broad obtuse lobes; capsule broadly oblong-obovate, abruptly contracted to a slender base, 6-winged, 2 to $2\frac{1}{2}$ inches long; seeds cuneate-obovate, 3 lines long, deeply concave on the upper side, the edges incurved, with a very prominent spongy raphe in the concavity.

Coast Range hills from Monterey Co. and Contra Costa Co. to Shasta Co., thence southward in the Sierra Nevada foothills to Sacramento Co. Most frequent in the North Coast Ranges from the Vaca Mts. to Sonoma Co. Mar.-Apr.

Locs.—Little Sur River acc. *F. G. Woodcock*; Santa Cruz Co. acc. *Anderson*; Port Costa, *Chandler* 866, *Hall* 1682; Ross Valley, *Chesnut & Drew*; Bear Valley, Marin Co., *Alice King*; Howell Mt., Napa Co., *Tracy* 1561; St. Helena, *Jepson* 507; Araquipa Hills, Solano Co., *Jepson*; Sonoma, *Bioletti*; Healdsburg, *Alice King*; Cazadero; Glen Ellen; Marysville Buttes, *Jepson*; Fair Oaks, Sacramento Co., *M. S. Baker*; Butte Creek, Butte Co., *E. M. Austin* 151; Redding, *Heller* 7882.

Refs.—*ARISTOLOCHIA CALIFORNICA* Torr. Pac. R. Rep. 4th: 128 (1857), type loc. Corte Madera, Marin Co., *Bigelow*; *Jepson*, Fl. W. Mid. Cal. 364 (1901).

SAURURACEAE. LIZARD-TAIL FAMILY.

Ours perennial astringent herbs, with nodose scape-like stems and alternate entire petioled leaves. Flowers perfect, bracteate, in a dense terminal spike. Perianth none. Stamens in ours 5 to 8. Ovary 1-celled, with 1 to 5 stigmas. Fruit a capsule or berry.—North America and Asia, 3 genera and 4 species.

1. ANEMOPSIS Hook.

Stoloniferous herb with aromatic rootstock and astringent somewhat spicy herbage. Leaves mostly radical. Spike conical, surrounded at base by a persistent showy involucre of 5 to 8 bracts; each flower (except the lowest) also subtended by a small white bract. Ovary sunk in the rachis of the spike; stigmas 2 or 3. Capsule dehiscent at the apex.—One species. (Greek anemone, and opsis, appearance, since the flowers resemble those of *Anemone*.)

1. *A. californica* Hook. YERBA MANSÁ. Stems hollow, $\frac{1}{2}$ to 2 feet high, with a broadly ovate or elliptic clasping leaf above the middle and a fascicle of 1 to 3 small petioled leaves in the axil; radical leaves elliptic-oblong, rounded above, often somewhat narrowed toward the cordate base, 2 to 8 inches long, on petioles 1 to 8 inches long; spikes $\frac{1}{2}$ to $1\frac{1}{2}$ inches long; involucre bracts white (or reddish beneath), oblong, $\frac{1}{2}$ to $1\frac{1}{4}$ inches long; floral bracts obovate, clawed, $2\frac{1}{2}$ to 3 lines long; ovules 6 to 10 on each placenta.

Common in saline and rather wet lowlands: lower Sacramento Valley south through the San Joaquin and South Coast Ranges to Southern California and north through the Mohave Desert to Inyo Co. East to Utah and w. Texas and south into Mexico. An infusion of the root is used by Spanish-Californians both as a liniment for skin troubles and as a tea for disorders of the blood.

Refs.—*ANEMOPSIS CALIFORNICA* Hook. Ann. Nat. Hist. 1: 136 (1833); Hook. & Arn. Bot. Beech. 390, t. 92 (1841); Hook. Bot. Mag. t. 5292 (1862); Cov. Contrib. U. S. Nat. Herb. 4: 192 (1893); Blochman, *Erythea*, 2: 39 (1894); *Jepson*, Fl. W. Mid. Cal. 162 (1901). *Anemia californica* Nutt. Ann. Nat. Hist. 1: 136 (1838), type loc. Santa Barbara and San Diego.

POLYGONACEAE. BUCKWHEAT FAMILY.

Ours herbs or low bushes with simple leaves. Flowers small, regular, mostly perfect, without corolla, and rarely solitary. Calyx 5 to 6-cleft or -parted. Stamens 4 to 9, more or less attached to the calyx. Ovary superior, 1-celled, 1-ovuled and bearing 2 or 3 styles or stigmas. Fruit an achene, mostly triangular in ours, sometimes lenticular.—About 32 genera and 700 species, found in all lands of the earth.

Bibliog.—Bentham, Geo., On the Eriogoneae (Trans. Linn. Soc. 17: 401-420,—1837). Torrey & Gray, Rev. Eriogoneae (Proc. Am. Acad. 8: 145-200,—1870). Watson, S., Eriogonum, Chorizanthe (Proc. Am. Acad. 12: 254-273,—1877). Parry, C. C., Chorizanthe (Proc. Davenport Acad. Sci. 4: 45-63,—1884; 5: 174-176,—1889); Lastarriaea (l. c. 5: 35-36,—1886); Notes of Eriogoneae (Bot. Gaz. 11: 54,—1886). Small, J. K., Monog. N. Am. Species of Polygonum (Mem. Columbia Coll. Dept. Bot. 1: 1-183,—1895); Studies in N. Am. Polygonaceae (Bull. Torr. Club, 25: 40-53,—1898; 33: 51-57,—1906). Greene, E. L., New Species of Eriogonum (Pitt. 5: 67-71,—1902); New Species of Polygonum (l. c. 197-203,—1903); Certain Polygo-

naceous Genera (Leaflets, 1: 17-50,—1904). Jones, M. E., [Notes on] *Eriogonum* (Contrib. 11: 4-18,—1903).

Leaves alternate or basal, always with sheathing stipules; involucre none.

Sepals 5, equal and erect in fruit; stigmas capitate.....1. *POLYGONUM*.

Sepals unequal, the inner row erect and enlarging in fruit, the outer row reflexed; stigmas tufted.

Leaves not reniform; sepals 6.....2. *RUMEX*.

Leaves reniform; sepals 4.....3. *OXYRIA*.

Leaves opposite or basal, without sheathing stipules.

Flower or flowers subtended by one or several distinct bracts, or none.

Bract enlarged in fruit, 1-flowered, 2-lobed, 2-saccate on the back.....4. *PTEROSTEGIA*.

Bracts not saccate or enlarged in fruit.

Bracts none; stamens 9.....5. *PHYLLOGONUM*.

Bracts woolly; flowers in clusters.

Calyx glabrous; stamens 3.....6. *NEMACaulis*.

Calyx woolly; stamens 5 to 9.....7. *HOLLISTERIA*.

Bracts naked; stamens 3.....8. *LASTARRIAEA*.

Flowers borne in a tubular or turbinate involucre.

Involucral teeth spine- or bristle-tipped.

Involucre mostly 5 or 6-toothed, usually 1-flowered; stamens 3, 6, or 9; involucral lobes usually tipped with hooked spines.....9. *CHORIZANTHE*.

Involucre 4 or 5-cleft (usually deeply), 2 to many-flowered; stamens 9; involucral lobes ending in straight bristles.....10. *OXYTHECA*.

Involucre 3 to 8-toothed, the teeth not bristle-tipped.....11. *ERIOGONUM*.

1. *POLYGONUM* L. KNOTWEED.

Herbs, some water plants, some woody at base. Leaves entire, alternate, with scarious sheathing stipules ("sheaths"), these entire, ciliate or lacerate. Inflorescence various, the flowers on jointed pedicels. Calyx red, white, or sometimes greenish, in all ours 5-cleft or -parted, the divisions erect in fruit. Stamens 4 to 9. Styles 2 or 3. Achene lenticular or triangular, enclosed in the fruiting calyx. Embryo curved, lying in a groove at an angle of the endosperm.—About 160 species, all continents. (Greek *polus*, many, and *gonu*, knee, on account of the nodose zigzag stem of many species.)

A. Leaves not cordate.

1. *Flowers in axillary clusters or in spikes, racemes or panicles.*

Leaves ample, not jointed to the petiole.

Alpine or subalpine perennials with thick rootstocks; stamens 8; achene triquetrous.

Flowers in a single dense terminal raceme; stem simple; herbage glabrous.—Subgenus

BISTORTA1. *P. bistortoides*.

Flowers in clusters or panicles; calyx articulated with the pedicel.—Subgenus *ACONOGON*.

Flowers numerous in panicles2. *P. alpinum*.

Flowers 2 to 4 in axillary clusters.....3. *P. davisiae*.

Low valleys or at middle altitudes; flowers in spikes (usually geminate or paniculate), with small scarious bracts; calyx appressed to the triquetrous or lenticular achene; stamens 4 to 8, filaments filiform; sheaths cylindrical, truncate, entire.—Subgenus *PERSICARIA*.

Spikes 1 or 2; flowers red; stamens 5, exserted; achene lenticular; aquatic or marsh perennials.

Leaves elliptical or oblong; spikes oblong or ovate, $\frac{1}{2}$ to 1 inch long.....4. *P. amphibium*.

Leaves ovate-lanceolate; spikes more elongated, 1 to 3 inches long.....5. *P. muhlenbergii*.

Spikes several to many, in 2s or more or less paniculate; stamens 6 to 8, included; achene either lenticular or triangular; stream borders or marshy places.

Sheaths naked in age; spikes often drooping; sepals white or flesh-color; stamens 6; annual.....6. *P. lapathifolium*.

Sheaths truncate or truncatish, fringed with bristles; spikes erect.

Calyx not punctate.

Internodes strongly swollen above the nodes.....7. *P. fusiforme*.

Internodes not swollen.

Herbage mostly glabrous; annual.....8. *P. persicaria*.

Herbage strigillose; perennial.....9. *P. hydropiperoides*.

Calyx punctate; perennial10. *P. acre*.

Leaves mostly narrow and lanceolate, jointed upon a short petiole adnate to the short sheath of the scarious stipules; flowers in axillary clusters, the clusters either more or less separated or crowded into a terminal leafy spike; stamens mostly 8, the filaments or some of them often dilated at base; achene triquetrous.—Subgenus *AVICULARIA*.

Perennial and more or less suffrutescent.

Leaves revolute; flowers several in a cluster, crowded at the ends of the branches.... 11. *P. paronychia*.

Leaves plane; flowers 1 to 3 in each axil, less crowded.

Leaves linear; dry foothills.....12. *P. bolanderi*.

Leaves oblong or obovate; alpine.....13. *P. shastense*.

Annuals.

Plants prostrate; branches leafy to the ends.....14. *P. aviculare*.

Plants erect or ascending.

Flowers in axillary clusters; leaves little reduced upwards.

Achenes dull15. *P. ramosissimum*.

Achenes shiny16. *P. minimum*.

Flowers in very loose spikes; leaves much reduced upwards; plants $\frac{1}{2}$ to $1\frac{1}{2}$ feet high.

Flowers deflexed; achenes black, shining.....17. *P. douglasii*.

Flowers erect; achenes brownish, dull.....18. *P. spargulariaeforme*.

Flowers in dense terminal leafy spikes; plants $\frac{1}{2}$ to 4 inches high.

Flowers greenish white; "achene brown".....19. *P. imbricatum*.

Flowers whitish or rose-color; "achene black".....20. *P. watsonii*.

2. *Flowers strictly solitary in the axils of the leaves or bracts.*

Internodes in ours very short and the branches spike-like; stamens 8; achene triquetrous; leaves very narrow, not jointed to the lacerate stipule; ours slender wiry brittle annuals.—Subgenus *DURAVIA*.

Sheaths conspicuously lacerate.

Stems flowering above the base; sheaths lacerate into more or less bristle-like segments21. *P. californicum*.

Stems flowering from very base; stipules cottony.....22. *P. parryi*.

Sheaths 2-parted, the segments sharply but shortly toothed.....23. *P. bidwelliae*.

B. Leaves cordate.

Flowers in loose panicle racemes; stamens 8; achene triquetrous; twining plants.—Subgenus *BILDERDYKIA*.....24. *P. convolvulus*.

1. ***P. bistortoides* Pursh.** Stems several from a thick horizontal rootstock, 1 to $2\frac{1}{4}$ feet high, the leaves mostly basal, those above reduced and bract-like; leaves erect, oblong to linear-oblong, 4 to 8 inches long, the petioles half to as long; raceme dense, spike-like, $\frac{3}{4}$ to $1\frac{1}{2}$ inches long; flowers white, on slender pedicels, 2 to 4 lines long.

High wet meadows in the Sierra Nevada, San Bernardino Mts. and North Coast Ranges. East to the Rocky Mts. and far northward.

Locs.—Mt. San Jacinto, *Hall* 2358; Hocketts Mdns., Tulare Co., *Hall & Babcock* 5604; Giant Forest (Round Meadow was white with its flowers in June, 1900), *Jepson* 708; Twin Lakes, Alpine Co., *Hansen* 315; Bear Valley, Nevada Co., *Jepson*; Goosenest Mt., *Butler* 969; Morgan, Tehama Co., *Hall & Babcock* 4331; Sisson, *Hall & Babcock* 4070; Shackelford Cañon, *Chandler* 1708; Modoc Co., *M. S. Baker*; Trinity Summit, *Goddard* 103; South Yollo Bolly, *Jepson*; Snow Mt. (acc. *Zoe*, 4: 175); Sherwood Valley, *Davy* 5160.

Refs.—*POLYGONUM BISTORTOIDES* Pursh, Fl. 1: 271 (1814), type loc. Weippe, Idaho, *Capt. Lewis*; Piper, Contrib. U. S. Nat. Herb. 11: 230 (1906); Small, Monog. N. Am. Polygonum, 28, pl. 1 (1895). *P. bistorta* Wats, Bot. Cal. 2: 14 (1880), not L. *P. cephalophorum* Greene, Pitt. 5: 198 (1903), type loc. Mt. Conness, 3 Aug., 1890, *Harford*. *P. bernardinum* Greene, l. c. 199, type loc. Bluff Lake, San Bernardino Mts., *Parish*. *Bistorta leptophylla* Greene, Leaflets, 1: 20 (1904), type loc. high Sierra Nevada, *Bolander*.

2. ***P. alpinum* All.** Stems stout, erect, 2 to 7 feet high, arising from a fleshy rootstock, 1 to 2 inches in diameter; herbage glabrous or nearly so; leaves ovate, acuminate, 3 to 6 inches long, the short petiole narrowly wing-margined to the base; panicles terminal, loose, nearly or quite leafless, 3 to 7 inches long; flowers white.

Subalpine, Yosemite to Mt. Shasta and west to Marble Mt.

Locs.—Lake Tenaya, *Hall & Babcock* 3635; Hetch-Hetchy, *Jepson* 3488; Silver Lake, *Hansen* 314; Donner Lake, *Heller* 7123; Bear Valley, Nevada Co., *Jepson*; Klamath Range, *Jepson* 2833.

Refs.—*POLYGONUM ALPINUM* All. Fl. Pedem. 2: 206, t. 68, fig. 1 (1785), type European;

Small, Mem. Columbia Coll. Dept. Bot. 1: 32, pl. 3 (1895). *P. polymorphum* Ledeb.; Wats. Bot. Cal. 2: 15 (1880). *P. phytolaccaefolium* Meisn.; Small, Bull. Torr. Club, 19: 360 (1892), the type from California; Mem. Columbia Coll. Dept. Bot. 1: 34, pl. 4 (1895).

3. *P. davisiae* Brew. Stems simple or sparingly branched, 5 to 11 inches high, several from the crown of a thick taproot 1 or 2 inches in diameter; leaves ovate or oblong-ovate, minutely pubescent, often glaucous, $\frac{3}{4}$ to $1\frac{1}{2}$ inches long, subsessile or shortly petioled; flowers purplish green or yellowish, 2 to 4 in loose terminal or axillary clusters; achene half exserted from the persistent calyx.

High mountains, northern Sierra Nevada and North Coast Ranges, 6000 to 8000 feet.

Locs.—Snow Mt. (acc. Zoe, 4: 175); South Yollo Bolly, *Jepson*; Marble Mt., *Jepson* 2843; Trinity Summit, *Jepson* 2053; Salmon Mts., *Hall* 8619; Mt. Shasta; Lassen Peak, *R. M. Austin*; Placer Co., *Carpenter*; Carson Spur, *Hansen* 714. Mt. Lola, Nev., *Kennedy & Doten*.

Refs.—POLYGONUM DAVISIAE Brew.; Gray, Proc. Am. Acad. 8: 399 (1872), type loc. northern Sierra Nevada, *Brewer, Torrey, Miss N. J. Davis*; Small, Monog. N. Am. Polygonum, 38, pl. 6 (1895). *P. newberryi* Small; Merriam, N. Am. Fauna, 16: 145 (1899).

4. *P. amphibium* L. WATER PERSICARIA. Aquatic glabrous perennial with stout stems not branching above the rooting base; leaves floating, elliptical to oblong or oblong-lanceolate, truncate or rounded at base, 2 to 7 inches long on petioles $\frac{7}{8}$ to $2\frac{1}{2}$ inches long; sheaths leaf-bearing at about the middle; spike terminal, dense, ovate or oblong, $\frac{1}{2}$ to 1 inch long, on a commonly short peduncle; calyx bright rose-color, $1\frac{1}{2}$ to 3 lines long, the 5 stamens and 2-cleft style exserted; achene lenticular.

Ponds and lakes in Southern California and the Sierra Nevada, north to British Columbia and east to the Atlantic. Europe; Asia. Often terrestrial and almost equally successful as a land or water plant.

Locs.—Bluff Lake, San Bernardino Mts., *Nora Pettibone*; Kern Cañon, *Jepson* 1046; Hetch-Hetchy, *Chesnut & Drew*; Lake Tahoe, *Brewer* 2136; Donner Lake, *Heller* 7162; Placer Co., *Carpenter*; Silver Lake, Lassen Co., *Baker & Nutting*.

Var. *hartwrightii* Bissel. Sheaths rough-hairy, ciliate, usually with an abruptly spreading herbaceous margin.—Upper Sacramento Valley and northern Sierra Nevada; eastward to the Atlantic.

Refs.—POLYGONUM AMPHIBIUM L. Sp. Pl. 361 (1753), type European; Small, Monog. N. Am. Polygonum, 40, pl. 7 (1895). *Persicaria purpurata* Greene, Leaflets, 1: 27 (1904), type loc. Silver Lake, Lassen Co., *Baker & Nutting*. *P. insignis* Greene, l. c. 32, type loc. San Bernardino Mts., 9550 ft., *Wright* 1809. Var. *HARTWRIGHTII* Bissel, Rhod. 4: 105 (1902). *Polygonum hartwrightii* Gray, Proc. Am. Acad. 8: 294 (1870), type loc. New York, *Hart Wright*; Greene, Fl. Fr. 136 (1891).

5. *P. muhlenbergii* Wats. Perennial, aquatic or in half dry places; stems decumbent or suberect, 2 to 3 (or 6) feet high; leaves and upper portion of the simple stem usually appressed-hirsutulose or scabrous, the peduncle glandular with short hairs; leaves thin, ovate-lanceolate to lanceolate, acuminate or even attenuate, usually rounded at base, 3 to 8 inches long, the petioles 1 to $3\frac{1}{2}$ inches long; spikes 1 to 4 inches long, often in pairs; calyx rose-color or pink, 5-parted to the middle; stamens 5, exserted; style 2-cleft; achene lenticular.

Lakes and sluggish streams from the coast to the Sacramento Valley. Throughout North America.

Locs.—Cache Slough, Solano Co., *Jepson*; San Francisco, *Jepson*; Gilroy, *Jepson*; San Luis Obispo, *Jepson* 3069; Healdsburg, *Alice King*; Klamath River, Siskiyou Co., *Butler* 193; Honey Lake Valley, *Davy* 3321.

Refs.—POLYGONUM MUHLENBERGII Wats. Proc. Am. Acad. 14: 295 (1879), type from U. S.; *Jepson*, Fl. W. Mid. Cal. 161 (1901). *P. emersum* Britt. Trans. N. Y. Acad. Sci. 8: 73 (1889); Small, Monog. N. Am. Polygonum, 44, pl. 9 (1895). *Persicaria franciscana* Greene, Leaflets, 1: 42 (1904), type loc. Mountain Lake, S. F. *P. hesperia* Greene, l. c. 43, type loc. Searsville, San Mateo Co., *C. F. Baker* 1835. *P. dismaefolia* Greene, l. c. 44, type loc. Cloverdale, *Heller* 5823. *P. covillei* Greene, l. c., type loc. Visalia, *Coville & Funston* 1266.

6. *P. lapathifolium* L. COMMON KNOTWEED. WILLOW-WEED. Annual, commonly stout, 1 to 4 feet high, branching; herbage glabrous except a very

scanty glandular pubescence on the peduncles and a scabrous pubescence on the leaf-margins or the leaves beneath sometimes resin-dotted; leaves broadly lanceolate, mostly long-acuminate, cuneate at base, 4 to 5 inches long, short-petioled; spikes axillary and terminal, oblong and erect or linear and nodding, 1 inch long or more; bracts ovate, acute; calyx white or flesh-color; stamens 6, included; achene lenticular or rarely triangular.

Common along streams or in marshy lands, often whitening great areas. Aug.-Sept.

Locs.—Yreka, *Butler* 196; Howell Mt., *Jepson*; lower Sacramento River, *Jepson*; Ione, *Braunton* 1181; West Berkeley, *Jepson*; Alvarado, *Jepson*; Los Buellis Hills, Santa Clara Co., *R. J. Smith*; Bakersfield, *Heller* 7839; Lone Pine, *Jepson* 5150; Los Angeles, *Elizabeth Palmer*; Ramona, *K. Brandegee*; Calexico, *Parish* 8075.

Var. *incanum* Koch. Small, slender; leaves whitish beneath.—Berkeley, etc.

Refs.—*Polygonum lapathifolium* L. Sp. Pl. 360 (1753), type European; Small, Monog. N. Am. Polygonum, 54, pl. 14 (1895); *Jepson*, Fl. W. Mid. Cal. 161 (1901). *P. nodosum* Pers. Syn. 1: 440 (1805). *P. incarnatum* Auct. Var. *incanum* Koch, Syn. Fl. Germ. 711 (1837).

7. *P. fusiforme* Greene. Stems several or many from the base, dark red, assurgent, 2 to 3 feet high, the internodes fusiform-thickened above the nodes; leaves linear-lanceolate, acuminate at both ends, glabrous or strigulose on midrib, $2\frac{1}{2}$ to 4 inches long, subsessile; sheaths strigulose outside and at first shortly ciliate at summit; bracts obtuse, shortly ciliate; racemes dense, 1 to $1\frac{1}{2}$ inches long, usually paniculate; calyx red in bud, mostly white in anthesis, its segments 5 (or 4); stamens "4" to 7; achene "lenticular" or triquetrous, black, shining.

Colorado River Valley: Palo Verde, *Jepson* 5280.

Refs.—*Polygonum fusiforme* Greene, *Erythra*, 1: 259 (1893), type loc. Colorado River near The Needles, *N. C. Wilson*; Small, Monog. N. Am. Polygonum, 70, pl. 22 (1895). Perhaps too near *P. persicarioides* H.B.K. of New Mexico and Mexico.

8. *P. persicaria* L. LADY'S THUMB. Annual; resembling *P. lapathifolium* but sheaths strigose and the sheaths and truncate bracts ciliate; leaves subsessile; spikes shorter and erect; calyx red or white, not glandular; stamens generally 6, included.

Widely distributed in North America. Naturalized from Europe.

Locs.—(?) Lone Pine, *Jepson* 5151; St. Helena, *Jepson*; lower Sacramento River, *Jepson*; Navarro, *Byrbee*; Humboldt Co., *Chesnut & Drew*.

Refs.—*Polygonum persicaria* L. Sp. Pl. 361 (1753), type European; Small, Monog. N. Am. Polygonum, 66, pl. 20 (1895). *P. arcuatum* Greene, Pitt. 5: 201 (1903), type loc. Napa River.

9. *P. hydropiperoides* Michx. Perennial; stems 1 to 3 feet high, branching; sheaths hairy; spikes slender or filiform, often interrupted below; calyx small, flesh-color or whitish, not dotted; stamens 8.

Southern California: San Bernardino, acc. *Parish*; streams near the coast, acc. *Abrams*; Visalia, acc. *Coville*.

Refs.—*Polygonum hydropiperoides* Michx. Fl. Bor. Am. 1: 239 (1803), "Pennsylvania, Virginia, Carolina"; Small, Monog. N. Am. Polygonum, 80, pl. 27 (1895); *Abrams*, Fl. Los Ang. 122 (1904); *Cov. Contrib. U. S. Nat. Herb.* 4: 191 (1893).

10. *P. acre* H.B.K. DOTTED SMART-WEED. Perennial, rooting and decumbent at base, erect and branching above, 2 to 5 feet high, glabrous or the margin of the leaves scabrous; leaves ovate-lanceolate to linear-lanceolate, acuminate, attenuate to a very short petiole, 2 to 3 inches long; sheaths mostly bristly-ciliate, the short truncate bracts mostly naked; spikes loose and slender, 1 to 3 inches long, erect on long peduncles or panicked; calyx greenish, conspicuously glandular-dotted; stamens 8; achene lenticular or triangular.

Common in low and especially marshy ground or in moist mountain meadows. Sept. An important bee-plant along the Sacramento River, the honey yield as heavy as from alfalfa (*M. C. Richter*).

Loes.—Trinity River valley, *Tracy* 3473; Howell Mt., *Jepson*; Napa River, *Jepson*; Berkeley, *Jepson*; Milpitas, *R. J. Smith*; San Mateo Co., *Jepson* 4159; Moss Lndg., Monterey Co., *Abrams* 4051; San Luis Obispo, *Jepson* 3068; Irishtown, Amador Co., *Hansen* 754; Witch Creek, *Alderson*.

Refs.—POLYGONUM ACRE H.B.K. Nov. Gen. et Sp. 2: 179 (1817), type trop. Am. *P. punctatum* Ell. Bot. S. C. & G. 1: 455 (1821); Small, Monog. N. Am. Polygonum, 88, pl. 31 (1895).

11. *P. paronychia* C. & S. Stems from large woody rootstocks, suffrutescent, prostrate or ascending, 1 to 3 feet long; branches leafy above, below clothed with old sheaths; sheaths large, 4 to 6 lines long, brown and 5-nerved, the margin freely lacerate above, persistent, the segments becoming hair-like in age; leaves linear-lanceolate, 5 to 8 (or 11) lines long, acute, the margin revolute; flowers about 3 in an axil, on short pedicels, densely crowded at the ends of the branches in short more or less leafy spikes; sepals white or rose-color, oblong-ovate, the green midvein with pinnately toothed outline; stamens 8, the 3 inner dilated at base.

Sand hills along the coast: middle California north to British Columbia.

Loes.—Monterey, *Berg*; San Francisco, *Setchell, Jepson*; Pt. Reyes, *Davy* 6877; Bucksport, *Tracy* 3200; Requa, *Goddard*.

Refs.—POLYGONUM PARONYCHIA C. & S. Linnaea, 3: 51 (1828), type loc. San Francisco, *Chamisso, Eschscholtz*; Small, Monog. N. Am. Polygonum, 94, pl. 34 (1895); *Jepson*, Fl. W. Mid. Cal. 159 (1901).

12. *P. bolanderi* Brew. Stems many, erect, 5 to 10 inches high, arising from a woody taproot or from prostrate woody branches; leaves narrowly linear to subulate, acute or cuspidate, 2 to 8 lines long, not revolute; sheaths persistent, 2-lobed on each side, the lower lobes finely lacerate; flowers white or rose-color, 1 or occasionally 2 in the axils on the branchlets; stamens 8 or 9.

Rocky outcroppings, Napa and Mt. Hood ranges. Possibly also at Salida, Stanislaus Co. July-Sept.

Refs.—POLYGONUM BOLANDERI Brew.; Gray, Proc. Am. Acad. 8: 400 (1872), type loc. Napa Valley, *Brewer, Bolander*; Small, Monog. N. Am. Polygonum, 140, pl. 57 (1895); *Jepson*, Fl. W. Mid. Cal. 159 (1901).

13. *P. shastense* Brew. Stems mostly simple, 2 to 6 inches long, several from the branching crown of a perennial root; leaves oblong or obovate, 3 to 4 inches long; stipules broad, silvery; flowers red or white, 2 or 3 in the axils; stamens 8.

High Sierra Nevada, 7000 to 9000 feet; north to Mt. Mazama, Oregon.

Loes.—Mt. Shasta, *Jepson*; Lassen Peak, *Mrs. E. M. Austin*; Donner Pass, *Heller* 7151; Pyramid Peak, *Hall & Chandler* 4744; Long Mdw., Tuolumne Co., *Chesnut & Drew*; Mt. Goddard, *Hall & Chandler* 684; Mt. Silliman, *K. Brandegee*. Mt. Rose, Nev., *Kennedy* 1137.

Refs.—POLYGONUM SHASTENSE Brew.; Gray, Proc. Am. Acad. 8: 400 (1872), type spms. from Mt. Shasta and Carson Pass, *Torrey, Brewer*; Small, Monog. N. Am. Polygonum, 96, pl. 35 (1895); Merriam, N. Am. Fauna, 16: 144 (1899).

14. *P. aviculare* L. WIRE GRASS. YARD GRASS. Annual; stems wiry, minutely striate, prostrate or ascending, often several feet long, flowering from the base; herbage glabrous and green; leaves oblong, acute, 3 to 6 lines long; flowers on very short pedicels, 2 lines broad when expanded; calyx cleft, the oblong lobes white with a green center; stamens 8, the 3 inner with dilated bases; styles 3, very short; achene ovoid, dark brown, minutely granular.

Naturalized from Europe; common in hard, especially beaten soils, and sometimes in cultivated lands; flowering through the dry season and until after the rains break. Var. LITTORALE Koch. Leaves thick, often obtuse.

—Maritime form.

Refs.—POLYGONUM AVICULARE L. Sp. Pl. 362 (1753), type European. Var. LITTORALE Martens & Koch, Deutsche Fl. 3: 59 (1831).

15. *P. ramosissimum* Michx. Annual, with the aspect of *P. aviculare* but erect and 1 to 2 feet high; leaves oblong to lanceolate, $\frac{3}{4}$ to $1\frac{1}{4}$ inches long, somewhat reduced above; calyx greenish or yellowish; stamens 3 to 6; achene black, dull.

California; north to Saskatchewan and east to the Atlantic.

Locs.—Pasadena, *Grant* 1020; Yosemite, *Hall* 9131. Rarely noted in Cal.

Refs.—POLYGONUM RAMOSISSIMUM Michx. Fl. Bor. Am. 1: 237 (1803), type loc. Illinois. *P. erectum* Wats. Bot. Cal. 2: 11 (1880), not L.

16. *P. minimum* Wats. Annual; stems usually several from the base, 2 to 4 (or 6) inches long, ascending; herbage glabrous, scaberrulous at the nodes; leaves ovate or elliptic, 2 to 6 lines long, apiculate, evenly distributed or somewhat crowded at ends of branches; flowers in all the axils, greenish white; stamens 5 to 8; achene slightly exserted, black, smooth, shining.

Central Sierra Nevada to Siskiyou Co., 4000 to 7000 feet; north to Alaska, east to Utah.

Locs.—Mt. Watkins, *Hall* 9170; Donner, *Brandegee*; Shakerford Creek, *Butler* 1776.

Refs.—POLYGONUM MINIMUM Wats. Bot. Kings, 315 (1871), type loc. Wahsatch and Uintah mountains, Utah; Small, Monog. N. Am. Polygonum, 128, pl. 51 (1895).

17. *P. douglasii* Greene. Annual, mostly sparingly branched and strictly erect, 8 to 21 inches high; leaves linear-oblong or -lanceolate, acute, thinnish, 1 to 1¼ inches long; sheaths lacerate; flowers reddish, 2 lines long, scattered, on deflexed pedicels; achene triquetrous, jet-black, smooth and shining.

High mountains, California, 4000 to 8000 feet; north to British Columbia, east to Texas and Maine.

Locs.—Volcano Creek, *Jepson* 956; Yosemite, *Jepson* 5668; Bear Valley, Nevada Co., *Jepson*; South Yolla Bolly, *Jepson*. The following have the achene smooth and shining on the angles but otherwise dull black and slightly roughened like morocco leather: Bluff Lake, San Bernardino Mts., *Nora Pettibone*; Bubbs Creek, *Jepson* 780; Sisson, *Jepson*.

Var. *latifolium* Greene. Leaves oblong; flowers mostly crowded towards the ends of the branches.—Pacific Coast.

Var. *austinae* Jones. Leaves ovate to lanceolate, 3 to 6 lines long; calyx green with whitish margins, 1 line long; achene black, smooth and shining.—Modoc Co., northerly to Idaho.

Refs.—POLYGONUM DOUGLASII Greene, Bull. Cal. Acad. 1: 125 (1885), type from western America; Fl. Fr. 134 (1891); Small, Monog. N. Am. Polygonum, 118, pl. 46 (1895). Var. LATIFOLIUM Greene, l. cc. *P. tenue* Wats. Bot. Cal. 2: 12 (1880), not Michx. Var. *latifolium* Engelm. in Wats. l. cc. *P. montanum* Greene, Pl. Bak. 3: 13 (1901). Var. AUSTINAE Jones, Contrib. 12: 75 (1908). *P. austinae* Greene, Bull. Cal. Acad. Sci. 1: 212 (1885), type loc. Modoc Co., sagebrush plains, *R. M. Austin*.

18. *P. spargulariaeforme* Meisn. Annual, much branched and somewhat diffuse, or sparingly branched and more strictly erect, 4 to 13 inches high; sheaths with a short mostly scarious base and lacerate summit; leaves linear or oblanceolate, 1-nerved, acute, ½ to 1½ inches long; spikes 4 inches long or less, very slender, the flowers much scattered below, crowded above; calyx rose-color or white; stamens 8, included, the filaments hardly dilated at base; style as long as the ovary, 3-parted.

Dry hills: North Coast Ranges to British Columbia in the coast region. Oct.

Locs.—Grouse Creek, Humboldt Co., *Chesnut & Drew*; Sisson, *Jepson*; Humbug Creek, Siskiyou Co., *Butler* 195.

Refs.—POLYGONUM SPARGULARIAEFORME Meisn.; Small, Bull. Torr. Club, 19: 366 (1892), type loc. Pacific Coast; Small, Monog. N. Am. Polygonum, 130, pl. 52 (1895). *P. coarctatum* Dougl.; Wats. Bot. Cal. 2: 12 (1880). *P. howellii* Greene, Pl. Bak. 3: 14 (1901), type loc. Siskiyou Mts., *Howell*. *P. exile* Eastw. Proc. Cal. Acad. ser. 3, Bot. 2: 286 (1902), type loc. Kings Cañon, *Eastwood*; stamens 3.

19. *P. imbricatum* Nutt. Annual; stem branching from the base or sometimes simple, erect, 1 to 3 inches high, the upper leaves scarcely smaller but crowded and with flowers crowded in their axils; leaves linear, acute, 3 to 5 lines long; stipules 2-cleft, the lower segments of each pair more or less united; flowers greenish white, very shortly pedicelled; stamens 5; styles nearly obsolete; achene brown, dull, smooth.

Sierra Nevada, 6000 to 8000 feet, Yosemite Park to Donner Lake; north

to Washington and east to Colorado. Probably no more than a low-branching form of *P. watsonii*.

Locs.—N. Fork Kings River, *Hall & Chandler* 4431; Ostrander's Mdw. near Yosemite, *Bolander* 6005; Lake Merced, *Jepson* 4421; Placer Co., *Carpenter*; Lassen Peak, *Jepson* 4075.

Refs.—POLYGONUM IMBRICATUM Nutt.; Wats. Am. Nat. 7: 665 (1873), type from the western U. S.; Piper, Contrib. U. S. Nat. Hb. 11: 228 (1906). *P. kelloggii* Greene, Fl. Fr. 134 (1891), type loc. Donner Lake; Small, Monog. N. Am. Polygonum, 134, pl. 54 (1895).

20. *P. watsonii* Small. Annual; stem simple or branching above the base, erect, $\frac{1}{2}$ to 4 inches high, the terminal portion of the stem or branches crowded with leaves and flowers; leaves linear to lanceolate, $\frac{1}{2}$ to 1 inch long or the uppermost 1 to 3 lines long; stipules deeply cleft into 2 lanceolate or ovate acuminate entire segments; flowers whitish or rose-color, 1 or 2 in each axil; stamens 3 to 5; styles evident; achene dark or black, the surface lightly lineate or very shallowly alveolate.

Alpine or subalpine, Sierra Nevada, 9000 to 10,000 feet, south to Mt. San Jacinto, north to British Columbia and east to Colorado.

Locs.—Willow Creek, Modoc Co., *Austin*; Truckee, *Sonne*; Cisco, *Harriet Walker* 1299; Snow Creek, Yosemite, *Hall* 9187; Eagle Peak, Yosemite, *Jepson* 4371; Pine Ridge, Fresno Co., *Hall & Chandler* 191; West Vidette, *Jepson* 826; Kearsarge Pass, *Jepson* 883; Cottonwood Creek, Inyo Co., *Jepson* 5071; Mt. San Jacinto, *Hall* 2354.

Refs.—POLYGONUM WATSONII Small, Monog. N. Am. Polygonum, 138, pl. 56 (1895), excluding syn. type from the western U. S.; Piper, Contrib. U. S. Nat. Herb. 11: 228 (1906).

21. *P. californicum* Meisn. Slender wiry glabrous annual, 3 to 7 inches high, diffusely branched, the ultimate branches elongated and floriferous; leaves linear to filiform, cuspidate, 3 to 8 lines long, the back with strong midrib and revolute-ribbed on each margin; spikes often loose below, usually dense above with the sheaths overlapping; bracts lanceolate or subulate, 1 to 3 lines long; sheaths split to the middle or to the base into setaceous divisions; sepals white with rose-colored midvein; achene brown.

Dry foothills, Sierra Nevada and North Coast Ranges; north to Washington. July.

Locs.—N. Fork Kaweah, *Jepson* 580; Hazel Green, Yosemite Park, *Jepson*; La Grange, *Jepson*; Sheep Ranch, Calaveras Co., *Davy* 1613; Milton, *Davy* 1227; Ione, *Braunton* 1228; Sweetwater, El Dorado Co., *K. Brandegee*; Chico, *R. M. Austin*; Napa Valley, *Jepson*; Blue Lakes to Ukiah, *Jepson*; Mt. Sanhedrin, *Jepson*; Hullville, Lake Co., *Heller* 6066; Van Duzen River, *Tracy* 2922.

Refs.—POLYGONUM CALIFORNICUM Meisn. in DC. Prodr. 14: 100 (1856), type loc. east side of the Sacramento Valley, *Hartweg* 1944; Small, Monog. N. Am. Polygonum, 142, pl. 58 (1895); *Jepson*, Fl. W. Mid. Cal. 160 (1901). *P. greenei* Wats. Proc. Am. Acad. 14: 295 (1879), type spms. from Shasta Valley, *Greene*, and Chico, *Mrs. Bidwell*; Small, Monog. N. Am. Polygonum, 144, pl. 59 (1895); this is habitually like *P. californicum*, and is technically without distinctive characters.

22. *P. parryi* Greene. Dwarf compact annual, commonly branching from the base, 1 to 2 inches high; stems rigid and brittle, spike-like, because densely crowded with leaves and flowers even to the base; leaves narrowly linear, acute, cuspidate, 1 to 4 lines long; stipules so extremely lacerate as to appear cottony, and often hiding the flowers; achene triangular, chestnut-color.

Sierra Nevada; higher North Coast Ranges; north to Washington. June-July.

Locs.—Howell Mt., *Tracy* 1550; Gravelly Valley, Lake Co., *Jepson*; Buck Mt., Humboldt Co., *Tracy* 2832; Bear Valley, Nevada Co., *Jepson*.

Refs.—POLYGONUM PARRYI Greene, Bull. Torr. Club, 8: 99 (1881), type loc. Yosemite Valley, *Parry*; Small, Monog. N. Am. Polygonum, 146, pl. 60, fig. 1 (1895).

23. *P. bidwelliae* Wats. Annual; stems divergently branched, 1 to 4 inches high; leaves linear, 3 to 5 lines long, with a strong midrib and two marginal nerves on back; stipules ovate, sharply serrate or at length lacerate, imbricated on the spikes; calyx rose-color.

Chico; not otherwise known.

Refs.—POLYGONUM BIDWELLIAE Wats. Proc. Am. Acad. 14: 294 (1879), type loc. Chico, Mrs. John Bidwell; Small, Monog. N. Am. Polygonum, 146, pl. 60, fig. 2 (1895).

24. *P. convolvulus* L. BLACK BINDWEED. Twining or trailing annual, the stems 1 to several feet long; herbage glabrous, pale green; leaves 1 to 2 inches long, ovate, sagittate at base, acuminate at apex; flowers in axillary clusters or disposed in a raceme; calyx 5-cleft, in fruit minutely scurfy, closely investing the black achene.

Naturalized from Europe: Sisson; Ft. Bidwell; Yosemite; San Francisco.

Refs.—POLYGONUM CONVULVULUS L. Sp. Pl. 364 (1753), type European; Small, Monog. N. Am. Polygonum, 148, pl. 61 (1895).

2. RUMEX L.

Weed-like herbs, ours perennial except one. Leaves mostly basal, those on the stem alternate, the petioles with somewhat sheathing stipules. Flowers mostly greenish, sometimes reddish or yellowish, pediceled and borne in usually crowded whorls along the branches of the panicle. Calyx of 6 nearly distinct sepals, the 3 outer spreading or reflexed, the 3 inner larger, continuing to grow after flowering and hugging the achene, 1 or more of them in many of our species bearing a wart or callous grain on the back. Fruits, therefore, more conspicuous than the flowers. Stamens 6. Styles 3, short; stigmas tufted (wind-pollinated) and maturing before the stamens. Achene triangular.—About 110 species, all continents but mainly north temperate. (Old Latin name used by Pliny.)

Flowers perfect or some staminate on the same plant; inner sepals commonly reticulated, in fruit becoming much longer than the achene; pedicels jointed; roots yellow, scented, bitter.—LAPATHUM DC. (Docks).

Inner fruiting sepals entire (or nearly so) and

Without callous grains; pedicels not very prominently jointed.

Leaves rounded to acute at base.

Inner fruiting sepals broader than long.....1. *R. venosus*.

Inner fruiting sepals longer than broad.....2. *R. hymenosepalus*.

Leaves cordate at base.....3. *R. occidentalis*.

With callous grains (or 1 or 2 of the sepals naked), 1 to 2½ lines long; pedicels prominently jointed near the base.

Leaves strongly undulate, elliptical to oblong-lanceolate; fruiting sepals with a broad wing bordering the callous grain.....4. *R. crispus*.

Leaves slightly undulate; callous grain nearly covering fruiting sepals, leaving only a narrow wing.

Leaves linear, spatulate or oblong; callous grain toothed.....5. *R. berlandieri*.

Leaves oblong or ovate; callous grain not toothed.....6. *R. conglomeratus*.

Leaves plane, mostly lanceolate; fruiting sepals triangular, usually much larger than the callous grain.....7. *R. satcifolius*.

Inner fruiting sepals with very prominent slender teeth or bristles; callous grains 1 to 3.

Perennial; flowering branches elongated and

Spreading at wide angles; pedicels jointed near the middle....8. *R. pulcher*.

Suberect; pedicels jointed near the base.....9. *R. obtusifolius*.

Annual; flowering branches usually short, the whorls mostly spicate-crowded; pedicels jointed near the base.....10. *R. persicarioides*.

Flowers dioecious; callous grains none or minute; roots red, scentless.—ACETOSA DC. (Sorrels).

Leaves not lobed; sepals longer than achene; pedicels jointed.....11. *R. paucifolius*.

Leaves hastate; sepals shorter than achene; pedicels not jointed.....12. *R. acetosella*.

1. *R. venosus* Pursh. Stems erect, ¾ to 1½ feet high, from a running rootstock; leaves ovate or lanceolate, 2½ to 4 (or 6) lines long, on short petioles, with conspicuous dilated stipules; panicle nearly sessile, short, dense in fruit; inner fruiting sepals entire, without grains, round-cordate, 6 to 8 lines long and 8 to 14 lines broad.

Dry sandy valleys: Honey Lake Valley, Lassen Co., not otherwise known in California. Nevada north to Washington and east to Missouri.

Refs.—RUMEX VENOSUS Pursh, Fl. 2: 733 (1814), type from the Missouri River region; Trel. Rep. Mo. Bot. Gard. 3: 79, pl. 17 (1892).

2. *R. hymenosepalus* Torr. CANAIGRE. Stem 1 to 2 feet high, nearly simple, arising from a cluster of 2 to 12 tuberous or dahlia-like roots and end-

ing above in a dense panicle $\frac{1}{2}$ to 1 foot long; leaves oblong or tapering to each end, slightly succulent, somewhat wavy-margined, $\frac{1}{2}$ to 1 foot long; sheathing stipules conspicuous; pedicels jointed near the middle, $\frac{1}{2}$ to nearly as long as the fruit; inner sepals membranous and rosy in fruit, ovate, cordate at base, naked, 4 to 6 lines long.

Dry sandy washes and sandy plains from Kern Co. and Nipoma southward; most abundant on the San Fernando and San Bernardino plains, thence eastward to Arizona and New Mexico. Roots used in tanning leather. The plants do not, however, do well in cultivation, irrigation decreasing the amount of tannin. The leaf-stem is used as a substitute for rhubarb, whence the names Wild Rhubarb, Wild Pie-plant and Sour Dock.

Refs.—RUMEX HYMENOSEPALUS Torr. Bot. Mex. Bound. 177 (1859), type loc. New Mexico; Trel. Rep. Mo. Bot. Gard. 3: 80, pl. 18 (1892); Jepson, Fl. W. Mid. Cal. ed. 2, 135 (1911).

3. **R. occidentalis** Wats. WESTERN DOCK. Erect, glabrous, stout, and nearly simple, 3 to 6 feet high; leaves somewhat fleshy, oblong-ovate or ovate-lanceolate, truncate or cordate at base, 6 to 16 inches long, the petioles of the basal leaves longer than the blade; panicle strict, mostly very dense, 1 to 2 feet long, leafless or with a few small leaves below, rosy in fruit; pedicels 3 to 6 lines long, the joint below the middle obscure; inner fruiting sepals round-ovate, subcordate, naked, or rarely with a callous grain, 2 to 3 lines long.

Marshes in the valleys and marshy spots in the hills: San Francisco Bay region to Lassen Co. and Mt. Shasta. North to Alaska, east to Texas and Labrador. Stems from a taproot, as also in nos. 4 to 8.

Locs.—Berkeley, *Davy* 722; Collinsville, *Jepson*; Denver, *Jepson*; Humboldt Bay, *Tracy* 3148; Sisson, *Jepson*; Honey Lake Valley, acc. *Davy*.

Refs.—RUMEX OCCIDENTALIS Wats. Proc. Am. Acad. 12: 253 (1877), type N. American; Trel. Rep. Mo. Bot. Gard. 3: 81, pl. 19 (1892); Jepson, Fl. W. Mid. Cal. 156 (1901). *R. procerus* Greene, Pitt. 4: 305 (1901), type loc. marshy spots in coast hills about San Francisco Bay and Monterey.

4. **R. crispus** L. CURLY DOCK. Stem stoutish, $1\frac{1}{2}$ to 4 feet high; leaves bluish-green, very wavy-margined, elliptical to oblong-lanceolate, 3 to 10 inches long, the petioles 1 or 2 inches long; flowering branches strict with few leaves, the whorls dense, mostly crowded and red-brown in fruit; pedicels twice as long as the fruit, tumidly jointed near the base; inner fruiting sepals broadly ovate, 2 to $2\frac{1}{2}$ lines long, all with smooth callous grains, rarely 1 or 2 naked.

Very common weed in low and neglected lands in valleys and in the mountains to middle altitudes. Naturalized from Europe. The half-fleshy root has astringent and tonic properties. Blade more or less decurrent on the petiole, as in *R. conglomeratus*.

Refs.—RUMEX CRISPUS L. Sp. Pl. 335 (1753), type European; Trel. Rep. Mo. Bot. Gard. 3: 84, pl. 22 (1892); Jepson, Fl. W. Mid. Cal. 157 (1901).

5. **R. berlandieri** Meisn. MEXICAN DOCK. Stem rather stout and succulent, simple, 1 to 2 feet high, from a deep taproot; herbage not glaucous, darker green than in *R. salicifolius*; leaves linear to spatulate or narrowly oblong, 3 to 4 inches long, petioled; panicles leafless except for the main axis, the whorls dense, remote except above; pedicels prominently jointed below the middle; inner fruiting sepals ovate-triangular, erose or with 2 to 4 minute teeth on each side at base, $1\frac{1}{2}$ to 2 lines long; callous grains mostly unequal, irregularly colored on each side next to the sepal.

Colorado Desert. East to Texas and south into Mexico.

Locs.—Holtville, *Parish* 8078; Mesquite Lake, *Davy* 8024.

Refs.—RUMEX BERLANDIERI Meisn. in DC. Prodr. 14: 45 (1856), type specimens from Tampico, Mex., by *Berlandier*, and elsewhere by others; Trel. Rep. Mo. Bot. Gard. 3: 89, pl. 27 (1892); Tuomey, Ariz. Agr. Exp. Sta. Bull. 22: 23, fig. 8 (1897).

6. *R. conglomeratus* Murr. GREEN DOCK. Stems slender, 3 to 5 feet high, arising from a short mostly vertical rootstock which often crowns one or several fusiform roots; leaves ovate or mostly oblong, slightly undulate, 2 to 4 inches long, reduced above; flowering branches slender, erect, very long ($\frac{1}{3}$ to $1\frac{1}{2}$ feet), naked or with a lanceolate or ovate leaf subtending some or all of the remote whorls; pedicels as long as, or rather shorter than the fruit, tumidly jointed near the base and geniculate; fruit about 1 line long, the inner sepals oblong with callous grains mostly 3 and smooth.

Naturalized from Europe. Low moist valley lands throughout the state and in the mountains to middle altitudes.

Refs.—*RUMEX CONGLOMERATUS* Murr. Prodr. Fl. Goett. 52 (1770), type European; Trel. Rep. Mo. Bot. Gard. 3: 90, pl. 28 (1892); Jepson, Fl. W. Mid. Cal. 157 (1901).

7. *R. salicifolius* Weinm. WILLOW DOCK. Low spreading or erect, 1 to $2\frac{1}{2}$ feet high; leaves plane, glaucous, linear-oblong to oblong-lanceolate, acute at both ends, $1\frac{1}{2}$ to 5 inches long, short-petioled; flowering branches short (2 or less commonly 4 inches long), the lateral mostly divaricate; whorls dense, crowded, leafless, or 1 or 2 lower whorls remote and leafy; pedicels rather shorter than the fruit, jointed near the base and recurved but not geniculate; inner fruiting sepals triangular or triangular-ovate, pink-red, 1 to 2 lines long, the white callous grain only 1, or the grains 1, 2 or 3, even in the same panicle.

Wet places in valley lands and in the foothills, ascending to high altitudes in the mountains; distributed nearly throughout California. North to British Columbia. A variable species. We have specimens from Mt. San Jacinto at 6000 feet and from Bullfrog Lake, Sierra Nevada, at 11,000 feet, which are in appearance quite unlike the seaboard type. While one or more of the alpine or interior forms may represent distinct units, the evidence now available to us is insufficient for specific segregation.

Locs.—Eureka, Tracy 1157; Vacaville, Jepson; Berkeley, Jepson; Oakland, Davy (grains none); Alvarado, Jepson; Santa Barbara, M. S. Baker; Elsinore, McClatchie 51; Tehipite, Hall & Chandler 494; Carson Spur, Alpine Co., Hansen 752.

Var. *montigenitus* Jepson n. var. Flowering branches short and panicle more compact; inner fruiting sepals without callous grains or a calyx here and there with the grains subulate or small.—(*Panicula compactior*; calyx fructifer obsolete callifer undique, raro unus passim cum callibus subulatis parvisve.)—High montane (6000 to 11,000 feet): Yollo Bolly Mts.; Sierra Nevada; south to San Jacinto Mts. Seems conspecific with plants of the Rocky Mt. region more recently referred by authors to *R. mexicanus* Meisn., but all the forms of this variety are matched by occasional plants of the immediate coast region which we are referring to *R. salicifolius*.

Refs.—*RUMEX SALICIFOLIUS* Weinm. in Flora, 4: 28 (1821), type loc. San Francisco, Chamisso (Linnaea, 3: 60); Trel. Rep. Mo. Bot. Gard. 3: 87, pl. 26 (1892); Jepson, Fl. W. Mid. Cal. 157 (1901); Fernald, Rhod. 10: 17 (1908). *R. lacustris* Greene, Erythea, 3: 63 (1895), type loc. Silver Lake, Lassen Co., Baker & Nutting.

8. *R. pulcher* L. FIDDLE DOCK. Stem slender but rigid, widely parted into zigzag branches; leaves oblong or fiddle-shaped, 3 to $5\frac{1}{2}$ inches long, petioled; flowering branches simple, divaricate, sparsely leafy, the dense whorls remote or at least distinct, red-brown in fruit; pedicels about equaling the fruit, tumidly jointed in the middle; inner fruiting sepals with 5 to 10 awn-like teeth on each side; callous grains 1 to 3.

Common weed of valley waysides and vacant lots in towns; also in meadows and moist places in the foothills and mountains. Naturalized from Europe.

Refs.—*RUMEX PULCHER* L. Sp. Pl. 336 (1753), type European; Trel. Rep. Mo. Bot. Gard. 3: 91, pl. 29 (1892); Jepson, Fl. W. Mid. Cal. 157 (1901).

9. *R. obtusifolius* L. BITTER DOCK. Tall, slender, 3 feet high or more; leaves ovate-oblong to oblong-lanceolate, somewhat undulate, acute or obtuse,

truncate or cordate at base, 6 inches long or less, long-petioled; flowering branches in a rather strict panicle, leafless or with a few little-reduced leaves at the base; whorls loose, not crowded, the lower remote, pedicels slender, 1 to 2 times as long as the fruit, tumidly jointed toward the base; inner fruiting sepals ovate-deltoid, $1\frac{1}{2}$ to 3 lines long, with 3 to 5 thin triangular or subulate teeth on each side; grain 1 only or with 2 other small ones.

Naturalized European weed in low lands about San Francisco Bay.

Refs.—*RUMEX OBTUSIFOLIUS* L. Sp. Pl. 335 (1753), type European; Trel. Rep. Mo. Bot. Gard. 3: 91, pl. 30 (1892); Jepson, Fl. W. Mid. Cal. 157 (1901).

10. *R. persicarioides* L. GOLDEN DOCK. Stems soft and fistulous (at least below), prostrate or erect, seldom more than 1 foot high; herbage yellowish green, minutely pubescent; leaves oblong or lanceolate, truncate or subcordate at base, acute at apex, a little undulate, 2 to 4 inches long, rather short-petioled; flowering branches with scattered subequal leaves, the whorls mostly crowded or the lower remote; pedicels very unequal, tumidly jointed at base; inner fruiting sepals $\frac{3}{4}$ to $1\frac{1}{2}$ lines long, acutely produced at apex with 2 or 3 awn-like teeth on each side; callous grains 3; fruit almost bur-like.

Wet places by lakes or streams or in marshy lands. California north to British Columbia, east to the Atlantic.

Locs.—Nigger Slough, Los Angeles Co., Braunton 1877; Castroville, Abrams 4079; Mountain Lake, San Francisco, Jepson; Alvarado, Jepson; Upper Lake, Jepson; Butte Valley, Siskiyou Co., Butler 1877.

Refs.—*RUMEX PERSICARIOIDES* L. Sp. Pl. 335 (1753), type loc. Virginia; Trel. Rep. Mo. Bot. Gard. 3: 93, pl. 32 (1892); Jepson, Fl. W. Mid. Cal. 158 (1901). *R. maritimus* Wats. Bot. Cal. 2: 9 (1880), not L.

11. *R. paucifolius* Nutt. Stems 9 to 15 inches high, in clusters from the crown of a taproot; leaves mostly basal, linear to narrowly ovate or oblong, entire, 1 to 3 inches long, drawn down to petioles 1 to 2 times as long; flowers on slender leafless branches; pedicels jointed toward the base; inner fruiting sepals round-cordate, finely reticulated, 1 to $1\frac{1}{2}$ lines long, much longer than the achene.

Sierra Nevada, 3500 to 9500 feet. North to British Columbia and east to Colorado.

Locs.—Mt. Whitney, Culbertson 4371; Mt. Goddard, Hall & Chandler 661; Yosemite, Lumbert; White Horse Lake, Modoc Co., Baker & Nutting.

Refs.—*RUMEX PAUCIFOLIUS* Nutt. Jour. Acad. Phila. 7: 49 (1834), type loc. Flathead River, Idaho, Wyeth. *R. geyeri* Trel. Rep. Mo. Bot. Gard. 3: 78, pl. 15 (1892).

12. *R. acetosella* L. SHEEP SORREL. Stems tufted, $\frac{1}{2}$ to 2 feet high, arising from running rootstocks; lower leaves hastate, the upper reduced or the branches leafless and ending in the reddish (pistillate) or yellowish (staminate) panicle; pedicels as long or twice as long as the flowers, not jointed; staminate flowers 1 line long or less, the pistillate rather smaller; achene granular.

Naturalized weed; throughout the state, in places very common. The green leaves are very acid.

Refs.—*RUMEX ACETOSELLA* L. Sp. Pl. 338 (1753), type European; Trel. Rep. Mo. Bot. Gard. 3: 76, pl. 13 (1892); Davidson, Erythea, 1: 99 (1893); Jepson, Fl. W. Mid. Cal. 156 (1901).

3. OXYRIA Hill.

Alpine perennial herb. Leaves somewhat fleshy, round-reniform, long-petioled, mostly radical. Stems erect, bearing a panicle of small green perfect flowers. Calyx of 4 nearly distinct sepals, the 2 inner erect (appressed in fruit), the 2 outer spreading. Stamens 6. Stigmas 2. Achene thin and compressed, surrounded by a broad wing and thus orbicular in outline.—One species. (Greek oxus, sour, on account of the acid leaves.)

1. *O. digyna* Hill. MOUNTAIN SORREL. Stems simple, scape-like, 3 to 11 inches high, several from a large chaffy rootstock; flowers on slender pedicels;

achene $1\frac{1}{2}$ lines in diameter, very much larger than the sepals, entire or emarginate at each end.

Alpine, among cold wet rocks, 8000 to 12,000 feet: Sierra Nevada, south to Mt. San Jacinto and north to Mt. Shasta. North to the Arctic Circle and around the northern hemisphere.

Locs.—Farewell Gap, *Jepson* 1019, 1143; Mt. Whitney, *Jepson* 1062; Kearsarge Pinnacles, *Jepson* 856; Mt. Goddard, *Hall & Chandler* 656; Mt. Dana, *H. M. Evans*; Conness Creek, Yosemite Park, *Jepson* 3362; Castle Peak, Nevada Co., *Heller* 7097; Mt. Bidwell, Modoc Co., *Manning* 349.

Refs.—*OXYRIA DIGYNA* Hill, Hort. Kew. 158 (1768); Merriam, N. Am. Fauna, 16: 144 (1899). *Rumex digynus* L. Sp. Pl. 337 (1753), type European.

4. *PTEROSTEGIA* F. & M.

Annuals with very slender and weak stems and opposite leaves. Flowers solitary and nearly sessile in the axils, longer than the subtending bract. Bract rounded and more or less 2-lobed, dentate on the margin, in fruit enlarged, scarious and reticulated, loosely enclosing the achene and developing 2 sac-like protuberances on the back. Calyx 6 (or 5)-parted; stamens as many or fewer than the lobes.—One species. (Greek pteron, a wing, and stega, a covering, in reference to the bract.)

1. *P. drymarioides* F. & M. Stems commonly several from the base, usually with a branch at each node, diffuse or straggling, a few inches to $1\frac{1}{4}$ feet long; leaves roundish or broader than long and notched once or twice at apex or even cleft, or distinctly fan-shaped or obovate, 2 to 6 (or 10) lines broad, narrowed at base to a slender but mostly short petiole; flowers reddish, less than 1 line long; calyx-segments oblong-lanceolate.

Foothills, under trees in open woods, or in the shade of rock outcroppings, throughout California. North to Oregon, south to Lower California. Apr.-May.

Locs.—Morley's Sta., Shasta Co., *Baker & Nutting*; N. Tule River, *Purpus* 5686; Arbuckle, *Alice King*; Conn Valley, Napa Co., *Jepson*; Santa Maria, *Blochman*; Cañon Diablo, *Parish*; San Bernardino, *Jepson* 5527; Santa Monica, *Barber* 162; San Diego, *K. Brandegee*.

Refs.—*PTEROSTEGIA DRYMARIOIDES* F. & M. Ind. Sem. Hort. Petrop. 2: 48 (1835), type loc. Bodega; *Jepson*, Fl. W. Mid. Cal. 149 (1901).

5. *PHYLLOGONUM* Cov.

Prostrate annual with the leaves basal and in 3s at the nodes. Flowers yellow, pedicelled, borne in close fascicles at the nodes, without involuere or bracts. Calyx deeply cleft into 6 divisions. Stamens 9.—One species. (Greek phullon, leaf, and gonu, knee, on account of the leafy, not bractate, nodes.)

1. *P. luteolum* Cov. Stems several from the base, 3 to 5 inches long with 3 to 5 branches at the nodes; herbage yellowish, nearly glabrous; leaves obovate, drawn down to a petiole; calyx $\frac{3}{4}$ to 1 line long.

Death Valley region. Collected only by Coville.

Refs.—*PHYLLOGONUM LUTEOLUM* Cov. Contrib. U. S. Nat. Herb. 4: 190 (1893), type loc. Furnace Creek Cañon, Funeral Mts., *Coville* 584. *Eriogonum luteolum* Jones, Contrib. 11: 15 (1903).

6. *NEMACaulis* Nutt.

Annual with very slender stems and mostly basal white-woolly leaves. Flowers crowded in subglobose heads; heads sessile in the forks and along the branches, each flower subtended by an herbaceous bract. Calyx 6-cleft. Stamens 3. Achene short-ovoid.—One species. (Greek nema, thread, and kaulos, stem, referring to the slender stems.)

1. *N. denudata* Nutt. Stems prostrate or ascending. 6 to 14 inches long, glabrate, reddish; leaves spatulate, narrowed to a petiolar base, $\frac{1}{2}$ to $1\frac{1}{2}$ inches long, mostly basal with usually a few shorter ones in the axils of the lower bracts; bracts oblong, forming a whorl at the nodes; bracts of the flower-clusters obovate, 1 line long, glabrous below, white-woolly above, the

outer flowerless, the inner smaller; flowers yellowish, glabrous, $\frac{1}{2}$ line long, pedicellate.

Sea-beaches, sand-dunes and sandy soils: Southern California from San Pedro to San Diego and the western edge of the Colorado Desert. Lower California.

Locs.—Long Beach, *Parish*; Del Mar, *Jepson* 1617; San Diego, *K. Brandegee*; Carrizo Creek, *Brandegee*; Palm Sprs., *Parish* 4140.

Refs.—*NEMACAULIS DENUDATA* Nutt. Jour. Acad. Phila. ser. 2, 1: 168 (1848), type loc. San Diego, *Nuttall*. *N. nuttallii* Benth. in DC. Prodr. 14: 23 (1856); Wats. Bot. Cal. 2: 16 (1880).

7. *HOLLISTERIA* S. Wats.

White-woolly annual herbs. Leaves alternate, cuspidate, with a small lanceolate pair at base like stipules. Involucres solitary and sessile in the axils, composed of 3 almost distinct linear bracts, 2-flowered. Flowers unequally pedicelled, with a minute scarious bractlet at base. Calyx 6-cleft to the middle. Stamens 5 to 9, included. Achene glabrous.—One species. (Col. W. W. Hollister, pioneer Californian.)

1. *H. lanata* Wats. Stems several or many from the base, prostrate, 3 to 7 inches long; basal and lowest stem leaves oblanceolate, narrowed to a petiole, 1 to $1\frac{3}{4}$ inches long, glabrate; stem leaves ovate, sessile, cuspidate, 3 to 7 lines long, white-woolly; calyx 1 line long, very woolly outside, its lanceolate lobes green with a scarious margin.

Southern Monterey Co. easterly to the upper San Joaquin Valley.

Locs.—Oil City, *Heller* 7741; Caliente Creek, *Davy* 1902; Sumner, *K. Brandegee*.

Refs.—*HOLLISTERIA LANATA* Wats. Proc. Am. Acad. 14: 296 (1879), type loc. Cholame Valley, Monterey Co., *Lemmon*. *Chorizanthe floccosa* Jones, Contrib. 12: 74 (1908), type loc. Bakersfield, *Jones*.

8. *LASTARRIAEA* Remy.

Small fragile annual, diffusely branched from the base. Leaves linear, in a basal tuft and in whorls along the stem, the upper ones and the bracts with hooked awns. Flowers solitary, sessile in the forks and terminal, concealed by the involucre-like whorl of bracts. Calyx simulating an involucre, tubular, 5 to 6-cleft, the teeth with hooked awns. Stamens 3, inserted on the throat, the filaments with a small membranous tooth on each side.—One species. (J. V. Lastarria, 1817-1888, Chilean publicist and writer.)

1. *L. chilensis* Remy. Stems 2 to 10 inches long; herbage slightly hairy; floral bracts crowding the ends of the branchlets, scattered below; calyx 1 to 2 lines long.

Naturalized from Chile. Dry sandy soil: Antioch southward to Kern and Monterey cos. and Southern California, thence north to Mono Co. Lower Cal. May-June.

Refs.—*LASTARRIAEA CHILENSIS* Remy, in C. Gay, Fl. Chil. 5: 290, t. 58 (1849), type loc. Chile; *Jepson*, Fl. W. Mid. Cal. 149 (1901). *Chorizanthe lastarriaea* Parry, Proc. Davenport Acad. 4: 63 (1884); West Am. Sci. 1: 29 (1885).

9. *CHORIZANTHE* R. Br.

Low dichotomously branched annual herbs of summer. Leaves mostly in a basal rosette which disappears early in the dry season, the cauline leaves commonly reduced to opposite, ternate or unilateral bracts. Involucres commonly 1, sometimes 2 to 6-flowered, cylindric, urnshaped or triangular, always sessile, mostly 3 to 6-angled or -costate, 3 to 6-toothed or -cleft; teeth divaricate, cuspidate or awned, the awns commonly with a hooked tip. Flowers pedicelled or nearly sessile, without bractlets, included within the involucre or the calyx protruding. Calyx 6-parted or -cleft, colored, never herbaceous. Stamens usually 9, 6 or 3. Ovary glabrous.—Thirty Pacific Coast species in North America and 7 suffrutescent ones in Chile. Ours are of the deserts or arid foothills. The basal leaves are often different in color from the cauline

leaves or foliaceous bracts, both in *Oxytheca* and *Chorizanthe*. This difference is the more striking when it is associated with form differences as is notably the case in *Oxytheca perfoliata*. (Greek *chorizo*, to divide, and *anthos*, flower, on account of the parted calyx.)

A. Bracts entire.

Involucres urnshaped or the tube cylindric and slightly contracted below the teeth; teeth equal or the 3 alternate shorter, bordered by a scarious membrane; stamens 6 or 9, inserted at base or lower part of calyx-tube.

Involucre bordered by a broad membrane, the teeth excurrent from it.

Membrane white, the 6 involucreal teeth equal.....1. *C. membranacea*.

Membrane purple, 3 of the involucreal teeth usually inconspicuous or minute.....2. *C. nortoni*.

Involucral teeth bordered by a narrow membrane but distinct.

Calyx-lobes bifid, erect; Sierra foothills.....3. *C. stellulata*.

Calyx-lobes not bifid; Coast Ranges along the coast.

Mostly prostrate or diffuse; membrane of involucreal lobes not continuous around sinuses.....4. *C. pungens*.

Erect; membrane of involucreal lobes continuous around sinuses.....5. *C. douglasii*.

Involucres not scarious margined.

Involucreal tube cylindric, usually 6-ribbed; stamens 6 or 9, inserted at base or lower part of calyx-tube.

Plants erect.

Joints excessively fragile; calyx-lobes equal; plant yellowish.....6. *C. brevicornu*.

Joints less fragile.

Calyx-lobes not fringed.

Calyx-lobes entire; plant reddish.

Calyx-lobes equal; rare7. *C. breweri*.

Calyx-lobes unequal; common8. *C. staticoides*.

Calyx-lobes erosulate, very unequal.....9. *C. valida*.

Calyx-lobes, at least the inner, fringed.

Lobes very unequal, the inner fringed.....10. *C. palmeri*.

Lobes equal, all fringed.....11. *C. fimbriata*.

Plants prostrate or procumbently spreading.

Involucreal teeth subequal or 3 long and 3 short; coastal area, Southern California.

Plants low, spreading horizontally; flowers white.....12. *C. parryi*.

Plants procumbent; flowers yellow.....13. *C. procumbens*.

Involucreal teeth very unequal.

Involucre 6-ribbed.

One tooth very long and 5 very short; stamens 6 or 9.....

14. *C. uniaristata*.

Teeth very unequal; stamens 3.....15. *C. clevelandii*.

Involucre 4 or 5-ribbed; stamens 9.....16. *C. spinosa*.

Involucreal tube 3-angled, or cylindric but not ribbed or angled, in either case usually transversely corrugated; calyx tubular, shortly 6-cleft; stamens 6 or 9, inserted on its throat.

Involucreal tube 3-angled; teeth stout, divergent.

Teeth equal or in equal sets.

Teeth 3; cauline leaves usually none.....17. *C. orcuttiana*.

Teeth 6, the alternate 3 very short and inconspicuous; cauline leaves in pairs.....18. *C. polygonoides*.

Teeth 3, very unequal, foliaceous, ovate to lanceolate; very spiny.....19. *C. rigida*.

Involucreal tube cylindric, not ribbed or angled.

Involucreal lobes 3, equal, the tube strongly corrugated.....20. *C. corrugata*.

Involucreal teeth or lobes 5, one foliaceous and much larger than the other 4, the tube obscurely corrugated.....21. *C. watsonii*.

B. Bracts 3-lobed.

Involucre without spurs, sometimes the angles gibbous at base.

Involucres 4-angled, 4-toothed.

Bracts minute; involucreal teeth equal.....22. *C. vortriedei*.

Bracts very conspicuous and foliaceous, orbicular-perfoliate; teeth unequal.....23. *C. perfoliata*.

Involucres cylindric, not 4-angled.

Involucreal tube smooth, its teeth 4, unequal; bracts unilateral, 3-lobed, foliaceous and conspicuous.....24. *C. californica*.

- Involucral tube sulcate, its teeth 5, equal; bracts small.....25. *C. insignis*.
 Involucre with spurs at base.
 Spurs 6, spine-like; involucral teeth uncinat.....26. *C. leptoceras*.
 Spurs 3, saccate, each about as large as involucral tube; involucral teeth straight.....
 27. *C. thurberi*.

1. *C. membranacea* Benth. (Fig. 67a.) Erect, $\frac{1}{2}$ to $1\frac{1}{2}$ feet high, mostly simple below, once to thrice dichotomous above, the involucre in solitary capitate clusters along the branches or mostly terminal; herbage lanate, floccose in age, the upper surface of the leaves glabrate; leaves linear, sessile, or gradually narrowed into a short petiole, $\frac{1}{2}$ to $1\frac{1}{4}$ inches long; involucre urn-



Fig. 67. Involucres of CHORIZANTHE. a, *C. membranacea* Benth.; b, *C. nortoni* Greene; c, *C. pungens* Benth. x 5.

shaped, $1\frac{1}{2}$ to 2 lines long, wholly white-scarious between the awned teeth, or some involucre, especially solitary ones in the lower forks, wholly destitute of membranous border; awns slender, uncinat, and strongly divergent; flowers 2 or 3, unequally pedicelled, of these 1 or 2 undeveloped or obsolete; calyx woolly, its segments obovate or spatulate, the inner narrower, all clawed, united only at very base; stamens 9.

Coast Ranges, mostly towards the interior from Tehama Co. south to the Santa Inez Mts.; Sierra Nevada, in the foothills and lower part of the Yellow Pine belt. May-June.

Locs.—Salt Creek, Tehama Co., *Jepson*; Scotts Valley, Lake Co., *Tracy* 1657; Napa Range, *Jepson*; Vacaville, *Platt*; Mt. Diablo, *Jepson*; Crystal Springs, San Mateo Co., *Bolander*; Mt. Day, Santa Clara Co., *E. J. Smith*; Big Sur River, *Davy* 7435; San Antonio Trail, Santa Lucia Mts., *Jepson* 1665; Estrella, *Jared*; Santa Inez Mts., *Dunn*; Old Colony Mill, *K. Brandegee*, *Jepson* 633; Toll House, Fresno Co., *Hall & Chandler* 31; Yosemite, *R. J. Smith*; Bowers Cave to Hazel Green, *Jepson*; Sheep Ranch, Calaveras Co., *Davy* 1610.

Refs.—CHORIZANTHE MEMBRANACEA Benth. Trans. Linn. Soc. 17: 419, t. 17, fig. 11 (1837), type from California, *Douglas*; *Jepson*, Fl. W. Mid. Cal. ed. 2, 129 (1911).

2. *C. nortoni* Greene. (Fig. 67b.) Mostly 1-stemmed, 2 or 3-forked, or sometimes many-stemmed from base, 4 to 7 inches high, the involucre congested in terminal heads; leaves oblanceolate, 1 to $1\frac{3}{4}$ inches long; lower bracts foliaceous, the upper reduced; herbage hairy; involucre reddish, cylindric-urnshaped, 6-ribbed, margined by a broad scarious purple 6-lobed border; lobes unequal, the 3 larger triangular in outline, the 3 alternate often small or obsolete, all ending in a short uncinat awn; some earlier involucre solitary in the forks and these destitute of scarious margin; calyx rose-color, little exerted, its short oblong lobes equal, undulate-erosulate; stamens 6.

Mountains bounding the Salinas Valley and westward to the Pacific Ocean. June. Involucres often reticulate between the ribs.

Locs.—Big Sur, *Davy* 1431; Santa Lucia Creek, *Jepson* 4732; Burro Trail, Santa Lucia Mts., *K. Brandegee*; Bitterwater, *Eastwood*; Estrella, *Jared*.

Ref.—CHORIZANTHE NORTONI Greene, Pitt. 2: 164 (1891), type loc. Gonzales, *A. Norton*.

3. *C. stellulata* Benth. Stem erect, trichotomously branched, mostly above the base, 4 to 6 inches high, the involucre in cymose clusters or somewhat capitate; herbage hairy; leaves linear, acute, sessile, 5 to 8 lines long, in a rosette

at base and in whorls at the nodes or reduced above; involucre cylindrical, 6-ribbed, 2 lines long, reticulate between the ribs; involucre teeth 6, nearly equal, with scarious margins, the tips uncinate or straight; calyx-lobes bifid or usually so.

Sierra Nevada foothills.

Locs.—Clover Creek Falls, Shasta Co., *M. S. Baker* 460; Chico, *Parry*; Sweetwater Creek, El Dorado Co., *K. Brandegee*; Merced Co. foothills, *Buckminster*; Raymond, *Congdon*; Toll House, Fresno Co., *Hall & Chandler* 30.

Ref.—*CHORIZANTHE STELLULATA* Benth. in DC. Prodr. 14: 26 (1856), type loc. east side of the upper Sacramento Valley, *Hartweg* 1937.

4. *C. pungens* Benth. (Fig. 67c.) Stems prostrate or at first erect, more or less dichotomous, 2 to 15 inches long, the involucre in head-like clusters on very short lateral branchlets or terminal; herbage villous pubescent; leaves basal and in pairs at the lower nodes, spatulate or oblanceolate, narrowed to a petiole, $\frac{1}{2}$ to 2 (or 4) inches long, reduced above to bracts; involucre cylindrical-urnshaped, hairy, 1 to $1\frac{1}{2}$ lines long, subtended by subulate or acicular pungent bracts; involucre tube sharply 6-angled or -ribbed, unequally 6-toothed, the alternate teeth shorter, all uncinate and more or less scarious-margined towards the base; calyx white, its lobes equal, oblong, erose-denticulate, hairy on the outside; stamens 9 or 6.

Sand-dunes and sandy valleys along the coast from Marin Co. south to Santa Barbara Co.

Locs.—San Francisco, *Jepson*; Rockspur, Monterey Co., *K. Brandegee*; Seaside, *Heller* 6749; Pacific Grove, *Jepson*; Surf, *K. Brandegee*.

Var. *diffusa* Parry. Leaves all basal; scarious border of the involucre teeth pink.—Valleys, Santa Cruz to Monterey.

Var. *nivea* Curran. All the involucre teeth with scarious white margins, the alternate teeth smaller; calyx yellow, its lobes with white margin.—Mountains near San Luis Obispo; Seaside, *F. G. Woodcock*.

Var. *cuspidata* Parry. Involucre teeth without scarious margins or the margins scant, otherwise identical with the species.—San Francisco (*Davy* 1172) north to Dillon's Beach (*M. S. Baker*).

Var. *robusta* Jepson n. comb. Stems erect, branched above, $\frac{1}{2}$ to 2 feet high; heads large, dense, mostly terminal or subterminal; involucre teeth with narrow margins or none.—Bay region south to Monterey Bay: Alameda, *Jepson*; Colma, *K. Brandegee*; Aptos, *Parry*.

Refs.—*CHORIZANTHE PUNGENS* Benth. Trans. Linn. Soc. 17: 419, t. 19, fig. 2 (1837), type from California, *Douglas*; *Jepson*, Fl. W. Mid. Cal. 151 (1901). *C. andersonii* Parry, Proc. Davenp. Acad. 5: 175 (1889), type loc. Scotts Valley near Santa Cruz, *Anderson*. *C. douglasii* Parry, l. c. Var. *DIFFUSA* Parry, l. c. 4: 60 (1884). *C. diffusa* Benth. in DC. Prodr. 14: 26 (1856), type loc. Monterey, *Hartweg* 1938. Var. *NIVEA* Curran, Bull. Cal. Acad. 1: 274 (1885), type loc. mountains near San Luis Obispo. Var. *CUSPIDATA* Parry, Proc. Davenp. Acad. 4: 60 (1884). *C. cuspidata* Wats. Proc. Am. Acad. 17: 379 (1882), type loc. San Francisco, *M. E. Jones* 2386. *C. villosa* Eastw. Bull. Torr. Club, 30: 485 (1903), type loc. Bodega Pt., *Eastwood*. Var. *ROBUSTA* Jepson. *C. robusta* Parry, Proc. Davenp. Acad. 5: 176 (1889), type spms. from Aptos, *Parry*, and Alameda, *Greene*; *Jepson*, Fl. W. Mid. Cal. ed. 2, 129 (1911).

5. *C. douglasii* Benth. Stem erect, tri- or dichotomously branching, 4 to 6 inches high; basal leaves spatulate, shortly petioled, the cauline oblong to linear; bracts subulate; herbage somewhat hairy pubescent; involucre hairy, condensed in terminal heads, urnshaped-cylindrical, $1\frac{1}{2}$ lines long, sharply ribbed, reticulate between the ribs; involucre teeth spreading, membranous margined below the short hooked awn, the membrane continuous in the sinus between the teeth; calyx rather deeply cleft, its lobes equal, oblong-ovate, obtuse, erosulate.

Monterey Co.

Locs.—No exact station known. We maintain this as a species with misgivings but refer here with considerable certainty a collection made in Monterey Co. by Mrs. Mary S. Clemens

in 1907 (Herb. Pac. Grove Mus.). This material is scanty but seems distinct (as is too often the case when one is dealing with single sheets instead of ample series of specimens) from any of the forms referred to *C. pungens*. *C. douglasii* has long remained obscure and has rarely been honored with the citation of definite material. Dr. Parry accepted and described it as a species (Proc. Davenport Acad. 5: 175), citing as typical his specimens from the valleys back of Santa Cruz near Felton and Ben Lomond. These plants have purple membranes to the involucre teeth as described for the type, but we should, however, not regard them as specifically distinct from *C. pungens*.

Ref.—*CHORIZANTHE DOUGLASSII* Benth. Trans. Linn. Soc. 17: 418 (1837), type from California (probably Monterey Co.), Douglas.



Fig. 68. *CHORIZANTHE BREVICORNU* Torr., involucre, x 5.

6. *C. brevicornu* Torr. (Fig. 68.) Stems several from the base, erect, repeatedly and shortly dichotomous, yellowish, 3 to 8 inches high, excessively fragile; herbage minutely pubescent; leaves in a basal tuft, linear-oblongate, narrowed to a petiole, $\frac{1}{2}$ to 2 inches long; involucre in the forks and along the branchlets, 1-flowered, cylindric, 2 to $2\frac{1}{2}$ lines long, acutely 3-angled or 3-ribbed, with 3 smaller ribs between, minutely corrugated between the ribs; teeth 6, hooked, the 3 alternate smaller; flowers white, glabrous, sessile; calyx-tube long and slender, its lobes oblong, nearly equal, truncatish and erose at apex, barely exerted; stamens 3, at base.

Arid stony hills, Colorado and Mohave deserts north to Inyo Co. Nevada, Arizona. More fragile than any other species, the specimens usually disjoining completely when dry.

Locs.—Bishop Creek, Hall & Chandler 7262; Argus Mts., Purpus 5318; Barstow, Jepson 5377; Sheephole Mts., Hall 6056; Borego Spr., Brandegee; Pinto Mts., Hall 6029; Palm Cañon, Mt. San Jacinto, Jepson 1389; San Felipe Creek, Brandegee.

Ref.—*CHORIZANTHE BREVICORNU* Torr. Bot. Mex. Bound. 177 (1859), type loc. Gila River, Parry.

7. *C. breweri* Wats. Similar to *C. staticoides* but more diffuse; herbage canescent but reddish; involucre acutely 6-ribbed and reticulated, constricted a little below the spreading teeth, the alternate teeth somewhat smaller; calyx white, exerted, its lobes oblong to elliptic, obtuse, entire, subequal, at least when fully developed.

Hillside at Chorro near San Luis Obispo, K. Brandegee. Insufficiently known and perhaps only a variety of the next.

Ref.—*CHORIZANTHE BREWERI* Wats. Proc. Am. Acad. 12: 270 (1877), type spms. from San Luis Obispo, Brewer 461, and Santa Margarita Valley, Brewer 501. No. 501 has scariously margined involucre; otherwise it appears to be the same as no. 461. The type specimens are young. The following description is taken wholly from a duplicate specimen of the type no. 461. Diffuse, 3 or 4 inches high, somewhat canescent; leaves round-ovate, 4 to 6 lines long, abruptly drawn down to a petiole as long; involucre in terminal clusters on the branchlets, cylindric, 6-ribbed, 6-toothed, the 3 alternate teeth smaller; flowers whitish, very shortly pedicelled, included; calyx cleft over half-way, the outer lobes elliptic, the inner oblong, shorter, all the lobes entire.

8. *C. staticoides* Benth. Stems 1 or several from the base, erect or ascending, cymosely dichotomous, 4 to 10 (or 18) inches high, fragile at the joints, the sessile involucre solitary in the forks or congested at the end of the branchlets; herbage characteristically reddish, soft-pubescent, the under surface of the leaves white-woolly; leaves obovate to elliptic, 3 to 9 lines long, the petioles 1 to 3 times as long; involucre cylindric, 6-ribbed, 2 to $2\frac{1}{2}$ lines long, the teeth spreading, hooked at tip, 3 much larger than the 3 alternate or the latter obsolete; calyx white, rose-pink or deep rose, exerted, the lobes narrowly oblong, mostly entire, hairy on the back, the inner smaller and shorter; stamens 9 or 6.

Dry sandy plains: Southern California in the coastal region, north to Monterey Co. and east to the foothills and the floor of the upper San Joaquin Valley. Not known in the Mohave or Colorado deserts.

Locs.—Descanso, *K. Brandegee*; Witch Creek, *Alderson*; Coahuilla Valley, *Jepson* 1479; San Jacinto Valley, *Reinhardt*; Elysian Park, Los Angeles, *Braunton* 418; Riverside, *Wilder*; San Bernardino, *Parish*, *Jepson* 5565; McKittrick, *Heller* 7797; San Emigdio Cañon, *Davy* 1974; Alcalde, *Brandegee*; Pacific Valley, *Eastwood*; Rancho San Miguelito, *Jolon*, *Jepson* 1623; Atascadero, *Brewer* 894; Arroyo Grande, *King*; Bakersfield, *Davy* 1882; Greenhorn Mts., *Hall* & *Babcock* 5081; N. Fork Kaweah, *Jepson* 564.

Var. *nudicaule* *Jepson* n. comb. Herbage commonly greenish; flowers white. —Mountain slopes along the coast from Santa Barbara to Echo Mt.

Refs.—*CHORIZANTHE STATICOIDES* Benth. Trans. Linn. Soc. 17: 418 (1837), type from California, *Douglas*. *C. xanti* Wats. Proc. Am. Acad. 12: 272 (1877), at least as to the type spms. from Fort Tejon, being the one first cited. Var. *NUDICAULE* *Jepson*. *C. nudicaule* Nutt. Jour. Acad. Phila. ser. 2, 1: 166 (1847), type loc. Santa Barbara, *Nuttall*. *C. wheeleri* Wats. l. c., type loc. Santa Barbara, *Rothrock*, which is clearly the equivalent of *C. nudicaule* Nutt.

9. *C. valida* Wats. Erect, 4 to 6 inches high, once or twice di- or tri-chotomously branched; leaves spatulate; involueral teeth or lobes not margined but awned; awns mostly straight; inflorescence similar to the preceding; flowers pedicellate, partly exserted; calyx-segments oblong, erose-denticulate, hirsute along the back on the midvein, very unequal (the alternate only $\frac{1}{2}$ as long).

Sonoma; Petaluma; Russian River. Rarely collected and little known. Perhaps only a variety of *C. pungens*.

Refs.—*CHORIZANTHE VALIDA* Wats. Proc. Am. Acad. 12: 271 (1877), type specimens from Sonoma Co.; *Jepson*, Fl. W. Mid. Cal. ed. 2, 129 (1911).

10. *C. palmeri* Wats. Stem erect, trichotomous, 5 to 12 inches high, the ends of the simple or dichotomous branches bearing head-like clusters of erect compactly crowded involucre, the forks usually with solitary involucre; herbage hairy pubescent; leaves in a basal tuft, oblong-spatulate, $\frac{1}{2}$ to $1\frac{1}{4}$ inches long; bracts of the flower clusters setaceous; involucre cylindric or a little contracted upward, $1\frac{1}{2}$ to 2 lines long, 6-ribbed, 6-toothed, the larger 3 unequal, the smaller 3 nearly equal, all tipped with mostly straight spines; flowers rose-color, exserted, very shortly pedicelled; calyx shortly cleft, the outer lobes roundish, entire, the inner shorter, truncate or bifid, shortly laciniate-fringed; stamens 9.

Dry hills, Monterey and San Luis Obispo cos.

Locs.—*Jolon*, *K. Brandegee*; San Miguelito Rancho, *Jepson*; Nacimiento River, *Davy*; San Simeon, *K. Brandegee*; San Luis Obispo, *K. Brandegee*; Creston, *Barber*; Santa Maria, *Blochman*.

Ref.—*CHORIZANTHE PALMERI* Wats. Proc. Am. Acad. 12: 271 (1877), type loc. San Luis Obispo, *Palmer* 464.

11. *C. fimbriata* Nutt. Stem erect or diffuse, trichotomous at first node, then dichotomously branching, 4 to 10 (or 15) inches high, the involucre solitary in the forks or clustered along the terminal branchlets; herbage reddish, lightly pubescent; leaves basal, spatulate or obovate, narrowed to a petiole, 1 to 2 inches long; bracts subulate or acicular; involucre cylindrical, 2 to 3 lines long, 6-ribbed, ending in 6 spreading spine-tipped teeth, the alternate teeth smaller; teeth uncinatate (or straight); calyx white, exserted, its lobes ovate-lanceolate, equal, irregularly fringed on each side, mostly below the middle; stamens 6.

San Diego Co. May-July.

Locs.—San Diego, *Brandegee*, *Chandler*, *Jepson* 1591; Spring Valley, *Hall* 3892; Pala, *Parish* 4399.

Var. *laciniata* *Jepson* n. comb. Habit, foliage, involucre and pubescence that of the species; calyx rose-color, its lobes laciniate-fringed throughout.—San Diego Co.

Locs.—Witch Creek, *Alderson*; Cuyamaca, *K. Brandegee*; Descanso, *K. Brandegee*; Palomar, *Jepson* 1516. Also in Lower Cal.

Refs.—*CHORIZANTHE FIMBRIATA* Nutt. in Jour. Acad. Phila. ser. 2, 1: 168 (1847), type loc. San Diego, *Nuttall*; Torr. Pac. R. Rep. 5²: 364, t. 8 (1857). Var. *LACINIATA* *Jepson*. *C. laciniata* Torr. Pac. R. Rep. 7²: 19 (1856), type loc. San Felipe, *Thos. Antisell*.

12. **C. parryi** Wats. Stems several from the base, spreading horizontally and repeatedly forking, forming low flat-topped plants 3 to 15 inches broad, the involucre clustered at the ends of the branchlets; leaves oblong, narrowed to a short petiole, 4 to 9 lines long; involucre 1 line long, cylindric but somewhat contracted below the spreading teeth, the tube acutely 6-angled; teeth uncinate, 3 large alternating with 3 small; calyx white, its segments erosulate, the inner half as large as the outer; stamens 9.

Sandy or gravelly plains, San Bernardino Valley.

Locs.—Lugonia, *Parish*; West Riverside, *Hall*; San Bernardino, *Parish* 3674, *Jepson* 5523; Redlands, *Jepson* 5537; Colton, *Cleveland*.

Refs.—CHORIZANTHE PARRYI Wats. *Proc. Am. Acad.* 12: 271 (1877), type loc. Crofton, *Parry*. *C. fernandina* Wats. *Bot. Cal.* 2: 481 (1880), type loc. San Fernando Cañon, Los Angeles Co., *Mrs. A. E. Bush*; awns of the involucre, or some of them, straight; calyx-lobes nearly equal, the alternate narrower.

13. **C. procumbens** Nutt. Stems procumbent, several from the base, elongated and sparingly branched, 3 to 13 inches long, the involucre in small clusters along and towards the ends of the branchlets; herbage soft-pubescent; leaves spatulate or oblanceolate, in a basal tuft and at the lower nodes; bracts lanceolate; involucre 6-ribbed, with mostly 6 equal spreading teeth, or the 3 alternate shorter; calyx yellow, the inner lobes much smaller than the outer.

Southern California in the coastal region.

Locs.—Point Loma, San Diego, *K. Brandegee*; Elsinore, *McClatchie* 49; Witch Creek, *Al-derson*; Palomar, *Jepson* 1557, *Hall* 1983; San Bernardino, *Parish* 3663.

Ref.—CHORIZANTHE PROCUMBENS Nutt. in *Jour. Acad. Phila.* ser. 2, 1: 167 (1847), type loc. San Diego, *Nuttall*.

14. **C. uniaristata** T. & G. Stems prostrate, 2 to 6 inches long, with a short soft pubescence; leaves broadly spatulate, the bracts oblanceolate and cuspidate or nearly acicular towards ends of branches; involucre numerous and rather loosely cymose on the branches or sometimes densely clustered, cylindric-urnshaped, 6-ribbed, $1\frac{1}{2}$ to 2 lines long; involucre teeth awned, one awn long and straight, the others very short and hooked; flowers cream-color; outer calyx-lobes obovate, entire, the inner half as long, oblong, crenate; stamens 6 or 9.

Mt. Diablo and through the South Coast Ranges to San Luis Obispo Co., thence east to the Sierra Nevada in Kern Co.

Locs.—Jolon, *K. Brandegee*; Estrella, *Jared*; Havilah, Kern Co., *K. Brandegee*; Walker Basin, *Coville*.

Refs.—CHORIZANTHE UNIARISTATA T. & G. *Proc. Am. Acad.* 8: 195 (1870), type loc. New Idria, *Brewer*; *Jepson*, *Fl. W. Mid. Cal.* 151 (1901).

15. **C. clevelandii** Parry. Stems prostrate, branched from the base, 4 to 10 inches long; herbage hairy pubescent; basal leaves ovate-spatulate, cauline leaves narrow and pungent; involucre 6-ribbed, with unequal divergent uncinate teeth; outer calyx-lobes broadly oblong, truncate, erosulate or denticulate, the inner about half as long as the outer; stamens 3.

Region of Clear Lake. Closely allied to *C. uniaristata*.

Locs.—Mt. Hanna, *Jepson*; Kelsey, *K. Brandegee*; Mt. Konocti, *Jepson*; Grizzly Cañon, *K. Brandegee*; Scotts Valley, *Tracy* 1740; Eel River, *Purpus* 1245.

Refs.—CHORIZANTHE CLEVELANDII Parry, *Proc. Davenport Acad.* 4: 62 (1884), type loc. Allen's Sprs., Lake Co., *D. Cleveland*; *Jepson*, *Fl. W. Mid. Cal.* 151 (1901).

16. **C. spinosa** Wats. Stems several from the base, prostrate, forming a loose spiny mat 8 to 16 inches broad; herbage puberulent; basal leaves oval or obovate, narrowed to a petiole with a broad or clasping base; bracts lanceolate, setaceous, conspicuous, their axils bearing clusters of 3 or 4 involucre; involucre short-cylindric, 4 or 5-costate, the teeth very unequal, usually with 1 long tooth, 1 or 2 minute ones and 1 or 2 of intermediate size, all straight-awned; flowers 2 or 3, pedicelled, usually only 1 developed; calyx white, the 3

outer lobes orbicular with a short narrow claw, the 3 inner ovate, smaller, minute; stamens 9.

Mohave Desert: Muroc (*Yucca*), *K. Brandegee*. A very distinct species.

Refs.—*CHORIZANTHE SPINOSA* Wats. Bot. Cal. 2: 481 (1880), type loc. Mohave Desert, Lemmon, not "San Bernardino"; Parish, Zoe, 5: 113 (1901).

17. *C. orcuttiana* Parry. Stems several from the base, prostrate, 1 to 4 inches long, sparingly dichotomous; herbage thinly pubescent; leaves spatulate or narrowly oblanceolate, mostly in a basal tuft; involucre scattered along the branches and terminal; involucre tube nearly 1 line long, cylindric but 3-angled, 3-toothed, not or only obscurely reticulated, its stout teeth nearly or quite horizontally spreading and as long as the tube; flowers usually 1, pedicelled; "calyx-lobes equal, its tube narrowly turbinate; stamens 9 or fewer."

Point Loma, San Diego (only known station). Quite like *C. polygonoides* in habit but its involucre very different.

Ref.—*CHORIZANTHE ORCUTTIANA* Parry, Proc. Davenport Acad. 4: 54 (1884), type loc. San Diego, *Orcutt*.

18. *C. polygonoides* T. & G. Dichotomously branched, forming mats 5 to 10 inches across; basal leaves oblanceolate, contracted to a petiole, $\frac{3}{4}$ to $1\frac{1}{2}$ inches long; bracts in pairs, oblanceolate or obovate, resembling the leaves of the basal rosette and becoming smaller towards the ends of the branches; involucre obpyramidal, strongly 3-angled, corrugated between the ribs, without scarious margin, solitary or in 2s or 3s, the tube 1 to $1\frac{1}{2}$ lines long, the 3 larger lobes as long and with alternating short and inconspicuous ones at base.

Central Coast Ranges; northern Sierra Nevada foothills; San Diego Co. The floristic distribution seems erratic, and the range is therefore, in all probability, insufficiently known.

Locs.—Big Valley, Modoc Co., *Baker & Nutting*; Scotts Valley, Lake Co., *Tracy* 1724; Howell Mt., *Tracy* 1564; Tamalpais, *K. Brandegee*; Oakland Hills, *K. Brandegee*; Sheep Ranch, Calaveras Co., *Davy* 1612; San Diego, *Brandegee*.

Refs.—*CHORIZANTHE POLYGONOIDES* T. & G. Proc. Am. Acad. 8: 197 (1870), type loc. Placerville, *Volney Rattan*; Jepson, Fl. W. Mid. Cal. ed. 2, 130 (1911).

19. *C. rigida* T. & G. Stem erect, 1 to 3 inches high, simple or very shortly branched, densely packed with short involucre-bearing branchlets, or sometimes diffusely spreading and forming a spiny mat 6 to 11 inches broad; leaves on the primary stem or branches round-ovate to obovate, 4 to 12 lines long, on petioles 1 to $1\frac{1}{2}$ times as long, those of the branchlets lanceolate or subulate, spine-tipped, becoming hard and rigid, the involucre in clusters in their axils; involucre tube short, about 1 line long and as broad, strongly and acutely 3-angled and strongly reticulated between the angles, its lobes 3, foliaceous, ovate to lanceolate, spreading, unequal, very unequal also on different involucre on the same plant, 3-ribbed and reticulate on back, 1 to 8 lines long, tipped with straight short spines; flower pedicelled, yellowish; calyx-tube narrow, abruptly expanded into the short throat and limb, its lobes oblong, short, very hairy on back, scarcely exerted; stamens 9, inserted at throat.

Colorado Desert and the eastern Mohave north to Inyo Co. Southern Nevada; Arizona. Lower California. Apr.-May. One of the most characteristic annuals on the driest stony hills where there is little or no other vegetation.

Locs.—Keeler, *Brandegee*; Argus Mts., *Hall & Chandler* 6897; Ludlow, *Hall* 6109; Calico Wash, *Jepson* 5388, 5409; Barstow, *Jepson* 4792 (plants prostrate forming a spiny mat); Chuckawalla Spr., *Hall* 5906; Borego Spr., *Brandegee*.

Refs.—*CHORIZANTHE RIGIDA* T. & G. Proc. Am. Acad. 8: 198 (1870). *Acanthogonum rigidum* Torr. Pac. R. Rep. 4th: 133 (1857), type loc. Williams River, Ariz., *Bigelow*.



Fig. 69. CHORIZANTHE
CORRUGATA T. & G.;
involucre, $\times 6$.

20. *C. corrugata* T. & G. (Fig. 69.) Stems several from the base, erect or ascending, 1 to 4 inches high, slightly villous; leaves roundish ovate, woolly or glabrate above, 2 to 9 lines long, on slender petioles; bracts subulate, small; involucre solitary in the forks and along the branches but numerous; involucre tube cylindrical, not angled or ridged but strongly corrugated, 1 to $1\frac{1}{2}$ lines long; involucre lobes 3, equal, ovate, as long as the tube, woolly above, reticulate below, short-awned, uncinat; calyx white, included; "stamens 6 or 9, on middle of tube."

Eastern Mohave Desert and southward along the Colorado River to the Colorado Desert and Lower California.

Locs.—Amboy, *K. Brandegee*; Ludlow, *Jepson* 5503, 5507; Chuckawalla Spr., *Hall* 5905; Coachella, *Greata*; Santa Maria Mts., *Schellenger*; Signal Mt., *Brandegee*.

Refs.—CHORIZANTHE CORRUGATA T. & G. *Proc. Am. Acad.* 8: 198 (1870). *Acanthogonum corrugatum* Torr. *Pac. R. Rep.* 5²: 364 (1857), type loc. Ft. Yuma.

21. *C. watsonii* T. & G. Stems erect or ascending, several from the base, dichotomous, 1 to 4 inches high; herbage canescent; leaves basal, narrowly oblanceolate; bracts in pairs, at length setaceous; involucre solitary in the forks and clustered towards the ends of the branchlets, canescent; involucre tube slender cylindric, not ribbed, obscurely corrugated, 2 to 3 lines long, its teeth 5, one foliaceous and usually much larger than the other four, especially on involucre solitary in the forks; flower pedicelled, included; calyx yellow, hairy externally; stamens 9, inserted at mouth of tube.

Eastern Mohave Desert, north to Inyo and Lassen cos. Nevada to Washington. Foliaceous lobe of the involucre 3 to 4 lines long.

Locs.—Lancaster, *Davidson*; Victor, *Hall* 6213; Barstow, *K. Brandegee*; Mt. Pinos, *Hall* 6355; Kernville and Lone Pine, *Brandegee*; Bishop Creek, *Hall & Chandler* 7247; Honey Lake, *Brandegee*.

Refs.—CHORIZANTHE WATSONII T. & G. *Proc. Am. Acad.* 8: 199 (1870), type specimens from Humboldt, Reese River and Grass valleys, Nev.; Wats., *Bot. King*, 313, pl. 34, figs. 4-6 (1871).

22. *C. vortriedei* Brandegee. Stem divaricately trichotomous at the first node, then dichotomous, 4 to 7 inches long, the internodes relatively long and the involucre solitary in the forks; herbage glabrous or a little glandular; leaves in a basal rosette, spatulate, $\frac{1}{4}$ to 1 inch long; bracts small, perfoliate, 3 (or 4)-lobed, the lobes triangular or oblong; involucre $1\frac{1}{2}$ lines long, the tube 4-sided or 4-angled, the angles at base somewhat gibbous or ridge-like; involucre teeth 4, short, ovate or triangular, cuspidate; flowers 2, long-pedicelled; calyx yellowish-green, 5-cleft, each short yellowish division bearing two white oblong lobes; stamens 9, inserted at base; seed black, globose, apiculate.

Local species of the southern Santa Lucia Mts. In aspect suggestive of being a starved form of *C. perfoliata*, and yet a very distinctive species, particularly in its peculiar calyx.

Ref.—CHORIZANTHE VORTRIEDEI Brandegee, *Zoe*, 4: 158 (1893), type loc. Santa Lucia Mts., *Vortriede*, *Eastwood*. Also collected on the Burro Trail, *K. Brandegee*.

23. *C. perfoliata* Gray. Stem branching at or near the base, diffuse with numerous branchlets, 8 to 13 inches high; leaves spatulate, 1 to 2 inches long; herbage sparingly pubescent or a little glandular; bracts perfoliate, orbicular or 3-lobed, spine-tipped at the angles; involucre strongly and acutely 4-angled, 2 or in age 3 or 4 lines long, mostly one at each node, wrinkled between the ribs, the 4 divergent teeth spine-tipped; angles or ribs sometimes swollen into a small gibbous projection at base; calyx pedicelled; stamens 6.

Inner South Coast Range from western Stanislaus Co. to the head of the San Joaquin Valley and the central Mohave Desert. In habit remarkably similar to *C. californica*.

Locs.—Puerto Cañon, Stanislaus Co., *Brewer* 1261; San Carlos Range, *Jepson* 2737; Estrella, *Jared*; Bakersfield, *Davy* 1884; Tehachapi, *K. Brandegee*; Kramer, *K. Brandegee*.

Ref.—*CHORIZANTHE PERFOLIATA* Gray, Proc. Bost. Soc. Nat. Hist. 7: 148 (1861), type loc. Ft. Tejon, *Xantus*.

24. *C. californica* Gray. Stem branching at or near the base, rather sparingly forked into slender spreading branches, 4 to 14 inches high; herbage glandular hirsute; basal leaves ovate or broadly oblanceolate, narrowed to a short petiole, $\frac{3}{4}$ to $1\frac{1}{4}$ inches long; bracts broader than long, divergently 3-lobed, the lobes spine-tipped, 4 to 8 lines long; involucre in 3s at each node, 1-flowered, $1\frac{1}{2}$ to 2 lines long, subcylindric, not ribbed, smooth, with stout spreading spine-tipped teeth; teeth mostly 3, unequal, sometimes with 4 in 2 unequal pairs or only 2; calyx white, the tube slender, a little exserted in anthesis, its lobes broadly oblong, very obtuse.

San Luis Obispo Co. to San Diego Co., mainly near the coast.

Locs.—Arroyo Grande, *Alice King*; Santa Maria, *Blochman*; Surf, *K. Brandegee* (a singular form with somewhat angular and urceolate involucre tubes and very large bracts); Santa Barbara, *M. S. Baker*; Los Angeles River, *Braunton* 417; San Bernardino, *Jepson* 5522; Playa del Rey, *Natho*; San Diego, *T. Brandegee*.

Refs.—*CHORIZANTHE CALIFORNICA* Gray, Proc. Bost. Soc. Nat. Hist. 7: 149 (1861). *Mucrona californica* Benth. Trans. Linn. Soc. 17: 419, t. 20 (1837), type from California, *Douglas*.

25. *C. insignis* Curran. Stem erect, divergently dichotomous, glandular, reddish, 3 to 4 inches high, the involucre solitary and secund along the branches; leaves in a basal tuft, linear-spatulate, glabrous, 3 to 6 lines long; bracts 3-lobed, the lobes oblong, those of the upper ones lanceolate-setaceous; involucre cylindric or obconic, slightly corrugate, lightly 5-sulcate, $1\frac{1}{2}$ lines long, armed with 5 horizontally divergent spines; spines equal, straight, as long as the involucre tube; flowers 4 to 6 in each involucre, pedicelled; calyx rose-color, hairy, exserted; "stamens 9."

Central Monterey Co.: Jolon; Indian Valley. A delicate and interesting species. Notwithstanding its spurless involucre it is very nearly allied to *C. leptoceras*. The discovery of this species obviously binds *C. leptoceras* more closely to the generic type of *Chorizanthe*.

Ref.—*CHORIZANTHE INSIGNIS* Curran, Bull. Cal. Acad. 1: 275 (1885), type loc. Indian Valley near the Salinas River.

26. *C. leptoceras* Wats. (Fig. 70a.) Stems 2 or 3 from the base, very slender, divaricately dichotomous, 3 to 11 inches long; herbage glabrous except a little pubescence on the bracts and involucre; leaves basal, oblanceolate, $\frac{1}{2}$ to 1 inch long; bracts 3-lobed, $1\frac{1}{2}$ to $2\frac{1}{2}$ lines broad; involucre in capitate clusters in the forks and terminal on the branchlets, the proper tube short, soon flaring into 6 lanceolate long-awned ciliate teeth and armed at base with 6 uncinate spine-like spurs; flowers 2 or 3; calyx campanulate, its spatulate lobes almost distinct; stamens 6.

Dry sandy plains at the southerly bases of the San Gabriel and San Bernardino mountains.

Locs.—Newhall acc. *Davidson*; Highland, *Parish*; San Bernardino, *Parish* 3646.

Refs.—*CHORIZANTHE LEPTOCERAS* Wats. Proc. Am. Acad. 12: 269 (1877). *Centrosteugia leptoceras* Gray; T. & G. Proc. Am. Acad. 8: 192 (1870), type loc. San Gabriel, *Lobb*.

27. *C. thurberi* Wats. (Fig. 70b.) Stems 1 or several from the base, dilate or tri-chotomously forking, 2 to 8 inches high; herbage glandular-hispidulose near the base, sparingly so above; leaves in a basal rosette, elliptic to oblong, 3 to 4 lines long; bracts small, 3-lobed and spine-tipped; involucre chartaceous, 2-flowered, solitary in the axils of the bracts, 2 lines long, cylindric, 5-toothed



Fig. 70. *a*, *CHORIZANTHE LEPTOCERAS* Wats.; involucre. *b*, *C. THURBERI* Wats.; involucre, x 6.

opposite with the third spur equidistant between them on one side. The side of the involucre opposite the third spur is therefore somewhat flattish (Helen Gilkey) and the single-toothed lobe of the tube (with its single nerve) stands over the interval between the nearly opposite spurs, whereas double-toothed lobes and double nerves correspond to the other intervals. This species is the type of Gray's *Centrostegia*, which by reason of its saccate spurs, peculiar involucre teeth and parted calyx, has some claims to consideration as a monotypic genus.

Locs.—Jacumba, *D. Cleveland*; San Felipe, *T. Brandegee*; Cuyamaca, *K. Brandegee*; Coyote Cañon, *Jepson* 1432a; Lancaster, *Hall & Chandler* 7387; Victor, *Jepson* 5617; Kramer, *Jepson* 5341; Mt. Pinos, *Hall* 6349; Tehachapi Pass, *Stokes*; Kernville, *T. Brandegee*; inner South Coast Range at Alcalde (acc. *Zoe*, 4: 158); Panamint Mts., *Hall & Chandler* 6978; Bishop, *Hall & Chandler* 7276.

Refs.—*CHORIZANTHE THURBERI* Wats. *Proc. Am. Acad.* 12: 269 (1877). *Var. cryptantha* Curran, *Bull. Cal. Acad.* 1: 275 (1885), type loc. Lancaster. *Centrostegia thurberi* Gray; Benth. in *DC. Prodr.* 14: 27 (1856), type loc. San Felipe, *Thurber*; *Torr. Pac. R. Rep.* 7²: 20, pl. 8 (1856).

10. *OXYTHECA* Nutt.

Slender annuals with the internodes more or less covered with stipitate glands and a repeatedly dichotomous inflorescence. Leaves in a rosette at base. Bracts more or less connate, often in 3s. Involucres 2 to several-flowered, more or less pedicellate, mostly turbinate, 4 or 5-cleft, each lobe bearing a bristle or awn. Flowers mostly exserted. Calyx glandular or pubescent on the outside. Stamens 9. Achene commonly lenticular.—About 8 Pacific Coast species in North America and 1 in Chile. (Greek *oxus*, sharp, and *theke*, case, in allusion to the spiny involucre.)

Involucres lobed.

Involucres 5-lobed; bracts united only at base.

Involucres deeply parted into linear to obovate lobes.

Plants prostrate; involucres sessile.....1. *O. luteola*.

Plants erect; involucres pedicelled.

Calyx-lobes entire2. *O. caryophylloides*.

Calyx-lobes cleft3. *O. trilobata*.

Involucre a shallowly-lobed concave disk; calyx-lobes fimbriate....4. *O. emarginata*.

Involucres acutely 4-lobed; plants erect.

Bracts completely united into a round concave perfoliate disk; involucres sessile or nearly so5. *O. perfoliata*.

Bracts united only at base; involucres mostly pedicelled.

Leaves revolute6. *O. dendroidea*.

Leaves plane7. *O. watsonii*.

Involucral tube short, not lobed, its margin with 14 to 21 bristles.....8. *O. parishii*.

1. *O. luteola* Parry. Stems prostrate, several from the base, branching, 2 to 5 inches long; herbage usually yellowish; leaves basal and in pairs at the lower nodes, rounded, 1 to 2 lines long, the petioles mostly longer; bracts linear, acerose, in 2s or 3s; involucres in the forks and along the branchlets, parted almost to the base into 5 unequal divisions, the divisions linear, acerose or

and 3-horned; teeth erect, tipped with a short straight spine; horns near base saccate, spreading, short, thick, each tipped with a short straight spine; flowers pedicelled; calyx deeply parted, hairy on the outside; stamens 9 or 6.

Arid valleys, Colorado and Mohave deserts north to Inyo Co.; southerly Sierra Nevada and San Carlos Range. S. Nevada, Arizona.

A singular species remarkable for its saccate spurs. The spurs do not diverge symmetrically but 2 of them stand almost

bristle-tipped, 1 to 3 lines long; flowers 7 to 11; calyx-tube subglobose, woolly, the glabrous yellow lobes spreading from its orifice.

Local species, known only from Lancaster in the Mohave Desert.

Ref.—*OXYTHECA LUTEOLA* Parry, Bull. Torr. Club, 10: 23 (1883), type loc. Lancaster, Parry 259.

2. *O. caryophylloides* Parry. Stem erect but diffusely branching above the base, 7 to 10 inches high, the involucre numerous along the branchlets and terminal, on pedicels 1 to 4 lines long; herbage glabrous or nearly so; leaves basal, obovate to oblong-spatulate, contracted to a petiole, $\frac{3}{4}$ to 2 inches long; bracts foliaceous, 3-parted into oblong divisions; involucre deeply parted into 5 nearly equal divisions, the divisions oblong, or a little widened upward, and abruptly awned; flowers 2 or 3; calyx short, greenish, obscurely lobed.

San Bernardino and San Jacinto mountains, 4000 to 6000 feet.

Locs.—Deep Creek, San Bernardino Mts., Hall; Fuller's Mill, Mt. San Jacinto, Hall.

Ref.—*OXYTHECA CARYOPHYLLOIDES* Parry, Proc. Davenport Acad. 3: 175 (1882), type loc. San Bernardino Mts., Parish Bros. 1097.

3. *O. trilobata* Gray. Stems one, sometimes several from the base, once trichotomous, then dichotomous, 4 to 14 inches high, the branches spreading; leaves in a basal tuft, spatulate, $\frac{1}{3}$ to 2 inches long, a little hairy; herbage sparingly glandular; bracts 3-lobed, the lobes acerose; involucre glabrous, glaucous, deeply 5-parted, borne on slender pedicels; pedicels solitary in the forks and axils of the bracts; involucre deeply lobed, its lobes oblong or spatulate, tipped with a bristle, 2 to 3 lines long; calyx segments 3-cleft into lanceolate acuminate lobes slightly erose on the sides.

Dry valleys: San Bernardino Valley south to San Diego Co.

Locs.—San Bernardino, Parish 3795; Mt. San Jacinto, Hall 2082, Jepson 2283; Coyote Cañon, Jepson 1434; between Julian and Cuyamaca, K. Brandegee (involucral lobes broad, often 2 or 3-toothed), Abrams 3807; Descanso, Stokes; Jacumba, Abrams 3663.

Ref.—*OXYTHECA TRILOBATA* Gray, Proc. Am. Acad. 12: 83 (1876), type loc. San Bernardino Valley, Lemmon & Parry.

4. *O. emarginata* Hall. Stem erect, tri- and di-chotomous, 2 to 6 inches high, the involucre in the forks and terminal on pedicels 1 to 6 lines long; herbage reddish, sparingly and minutely glandular; leaves in a basal rosette, oblanceolate, 4 to 8 lines long; bracts mostly 3-lobed; involucre obpyramidal, 2 to 3 lines high, shallowly 5-lobed, the lobes rounded, scarious-margined, awn-tipped; flowers 4; calyx 6-parted, its segments oblanceolate, fimbriate at apex.

Ridges about Tahquitz Peak, San Jacinto Mts., July. A rare and interesting species; possibly passed over elsewhere for *O. perfoliata* which it superficially resembles.

Ref.—*OXYTHECA EMARGINATA* Hall, Univ. Cal. Publ. Bot. 1: 75, pl. 14 (1902), type loc. Tahquitz Peak, Hall 231.

5. *O. perfoliata* T. & G. Stem erect but short, parting at the first node into 2 or 3 horizontally spreading branches 2 to 4 inches long; herbage slate-color or reddish, glabrous except a glandular band on lower half of internodes; leaves of the basal rosette oblong-oblanceolate, green, 6 to 12 lines long; bracts at first node 3 or 4, small, united only at base, the upper bracts very conspicuous, orbicular- or deltoid-perfoliate, spine-tipped at the angles, 4 to 9 lines broad, glaucous; involucre narrowly turbinate, 3 to 4 lines long, deeply and acutely 4-lobed, each lobe bristle-tipped; calyx whitish, $\frac{2}{3}$ line long, the outer segments minutely white-sealy.

Mohave Desert northward to Lassen Co. Nevada, Arizona.

Locs.—Victor, Hall 6181; Barstow, Jepson 5517; Argus Mts., Purpus 5315; Springville, Middle Tule River, Purpus 6054; Honey Lake Valley, Dary.

Refs.—*OXYTHECA PERFOLIATA* T. & G. Proc. Am. Acad. 8: 191 (1870), type specimens from Nev.; Wats. Bot. King, 311, pl. 34, figs. 1-3 (1871).

6. *O. dendroidea* Nutt. Stem erect, tri- and di-chotomously branching above the base, 7 to 14 inches high, hispidulose-glandular, the involucre nearly sessile or shortly pedicelled along the branchlets, or those in the forks mostly on pedicels 1 to 4 lines long; leaves linear to oblanceolate, revolute, acute, thinly hirsute, $\frac{3}{4}$ to $1\frac{1}{2}$ inches long; involucre narrowly turbinate, $\frac{1}{2}$ to 2 lines long, 4-lobed, the lobes with very unequal awns or sometimes the awns obsolete; flowers about 3; calyx pale rose or whitish, rough pubescent, very shortly lobed.

Lassen Co., not otherwise known in California. North to Washington and easterly through northwestern Nevada to Wyoming.

Locs.—Honey Lake, *Brandegee*; Reno, Nev., *Jepson* in 1896.

Ref.—*OXYTHECA DENDROIDEA* Nutt. Jour. Acad. Phila. ser. 2, 1: 169 (1848), type loc. Snake River sandhills, Rocky Mts., *Nuttall*.

7. *O. watsonii* T. & G. Stem erect, dichotomously branching above the base, 6 to 9 inches high, glaucous; leaves spatulate, $\frac{1}{2}$ to 1 inch long; bracts awned, reflexed; involucre turbinate, 4-lobed, with elongated awns, $1\frac{1}{2}$ lines long, borne on pedicels 2 to 5 lines long; flowers $\frac{1}{2}$ line long, white, puberulent.

Cushenberry Sprs., Mohave Desert, *S. B. & W. F. Parish* 1241. Nevada. The awned bracts are reflexed in Nevadan plants, but apparently not so in the Parish specimens.

Refs.—*OXYTHECA WATSONII* T. & G. Proc. Am. Acad. 8: 191 (1870), type loc. Monitor Valley, Nev., *Watson*; Wats. Bot. King, 311, pl. 33, figs. 5-7 (1871).



Fig. 71. *OXYTHECA PARISHII* Parry;
involucre, x 5.

8. *O. parishii* Parry. (Fig. 71.) Stem erect, diffusely but sparingly tri- and di-chotomous above the base, 8 to 14 inches high, glabrous and glaucous except a hispidulose-glandular band on the lower part of the internodes and on the pedicels; leaves basal, spatulate-obovate, $\frac{1}{2}$ to $1\frac{1}{4}$ inches long; bracts small, 3-cleft; involucre on axillary and terminal pedicels ($\frac{1}{4}$ to $1\frac{1}{4}$ inches long), the tube turbinate, short (1 line long), but developing from its margin a

circle of 14 to 21 excurrent bristles 2 to 3 lines long; flowers 5 to 14, pedicelled; calyx 6-cleft nearly to base, its lobes linear-oblong, almost distinct, pubescent on back; stamens 9.

San Gabriel and San Bernardino mountains, and north to Mt. Pinos, 4500 to 6500 feet.

Locs.—Mt. Wilson, *Davidson*, *Stokes*; Swartout Cañon, Mt. San Antonio, *Hall* 1250.

Refs.—*OXYTHECA PARISHII* Parry, Proc. Davenport Acad. 3: 176 (1882), type loc. San Bernardino Mts., *Parish Bros.* 993. This species has been made the type of the monotypic genus *Acanthosepyphus*, Small, Bull. Torr. Club, 25: 53 (1898), a genus resting essentially on the numerous involucral awns. While this is a striking character, it may be pointed out that the awns are sometimes few and that *Oxytheca trilobata* sometimes displays multiple teeth or awns. *O. abramsii* McGregor, Bull. Torr. Club, 36: 605 (1909), type loc. Topatopa Mts., Ventura Co., *Abrams & McGregor* 72, is a form with fewer (7 to 12) awns. Hall's 6452, Mt. Pinos, is the same.

11. *ERIOGONUM* Michx.

Annual or perennial herbs or small shrubs with basal or alternate or whorled leaves without stipules, those of the inflorescence commonly reduced to bracts. Flowers perfect, borne in an involucre, more or less exserted on their stalklets and commonly reflexed or recurved in age, intermixed with narrow scarious bractlets. Involucres 4 to 8-toothed or -lobed, several to many-flowered, borne

in heads, peduncled umbels, or solitary along the branches (either sessile or on "pedicels"), or terminal on scape-like stems. Calyx 6-parted or -cleft, colored, persistent about the achene. Stamens 9, inserted on the base of the calyx. Styles 3; stigmas minute, capitate. Achene triangular, except in a few species. Embryo straight, in the axis of scanty endosperm; cotyledons foliaceous.—About 140 North American species, mostly western. (Greek erion, wool, and gonu, knee or joint, the nodes hairy in some species.)

The species of *Eriogonum* often show considerable variability. Favorable or unfavorable conditions react most strikingly on the stems, branches and involucre, and least on the leaves which are very constant in texture, outline and size. The leaves in the herbaceous species are usually in a basal rosette, but even when typically so leaves may occasionally develop freely at the nodes, as in *E. virgatum*, *graeile*, *vimineum* and *dasyanthemum*. Vigorous individuals often develop many stems from the base (*E. vimineum*, *caninum*, and *truncatum*), or when less vigorous branch only at first node or sparingly. The size and degree of branching of the inflorescence is characteristically variable, particularly in the *E. umbellatum* and *E. nudum* groups. Simple and compound umbels are often borne on the same individual, and umbels are often condensed to a capitate condition or indeed reduced to a single involucre. Inflated stems may be expected in any form of the *E. inflatum* and *E. nudum* allies. Where there are several stems from the base, inflated and non-inflated stems may sometimes be borne in the same rosette, as in *E. inflatum* and in *E. trichopodum*. The shape of the flower is important, but inasmuch as in many species the flower changes in shape between anthesis and fruiting, invariable features in this regard should be guardedly separated from such characters as are subject to modification as growth proceeds. For example, in *E. ineanum* the short stipe-like base of the flower in its early condition is abruptly expanded into a bowl-shaped upper portion; later the calyx becomes vase-shaped and twice or thrice as long. In *E. thomasi* the calyx segments are nearly plane in early anthesis, in fruit they are twice as large and conspicuously saecate. In certain species some of the flowers in an involucre, especially the more shortly pedicelled ones, are sometimes found to be staminate, a condition also met with occasionally in species of *Chorizanthe* and *Oxytheca*. According to Miss S. C. Stokes, hybrids are quite common in some of the groups. In *Eriogonum fasciculatum* the glandular area at base of the calyx which provides the honey flow harvested by the domestic bee is very distinct. A similar area exists in *E. nudum* but is far less developed. Both species are protandrous. Honey arcs appear to be absent from the calices of *E. vimineum* and its allies.

A. Calyx not stipe-like at base.

Involucre turbinate or campanulate, 4 or 5-toothed or lobed, not angled, always borne on scattered pedicels, never congested in heads; annuals (except nos. 9 and 10); mostly deserts or arid plains.—Subgenus GANYSMA.

Plants with leaves at the nodes in the axils of the bracts as well as in a basal rosette, involucre 4-lobed or -toothed.

Involucre not cottony.

Inner and outer calyx-lobes very unlike.....1. *E. angulosum*.

Inner and outer calyx-lobes nearly alike.....2. *E. gracillimum*.

Involucre conspicuously cottony.....3. *E. gossypinum*.

Plants with the leaves all in a basal rosette (except nos. 4 and 8), rarely in the axils of the lower bracts; inflorescence with small bracts at the nodes, the bracts in 3s, triangular or oblong, and often more or less connate at base.

Involucre 4-lobed or -toothed, few (usually 1 to 3)-flowered.

Calyx nearly glabrous4. *E. spergulinum*.

Calyx at least in fruit with hooked bristles.

Involucres 2-flowered; achene exserted.....5. *E. hirtiflorum*.

Involucres 4 to 6-flowered; achene not exserted.....6. *E. inerme*.

Calyx hairy or glandular-hispid, its hairs not hooked.

Calyx segments notched or 3-toothed at apex.....7. *E. apiculatum*.

Calyx segments entire.

Leaves tomentulose or glabrate.....8. *E. ordii*.

Leaves hairy pubescent.

Calyx pinkish9. *E. parishii*.

Calyx yellow10. *E. trichopodum*.

Involucre 5-lobed or -toothed, several-flowered.

Calyx hairy or pubescent.

Stems usually inflated; leaves hairy-pubescent.....11. *E. inflatum*.

Stems not inflated or rarely.

Calyx segments not saccate-dilated.

Leaves obovate or rounded; involucre glandular...12. *E. pusillum*.

Leaves reniform; involucre not glandular.....13. *E. reniforme*.

Outer calyx segments saccate-dilated on each side.....14. *E. thomastii*.

Calyx glabrous.

Pedicels erect15. *E. thurberi*.

Pedicels not erect.

Outer calyx segments obovate; involucre on nodding pedicels.

Calyx attenuate at base.....16. *E. cernuum*.

Calyx not attenuate at base.....17. *E. nutans*.

Outer calyx segments cordate at base.

Involucre on divaricately spreading pedicels 1 to 4 lines long.....

18. *E. watsonii*.

Involucre on deflexed pedicels 1 line long or less...19. *E. deflexum*.

Involucres cylindric or cylindric-turbinate, 5-toothed, 5 (or 6)-nerved or angled, always sessile, solitary or congested in heads; annuals, perennial herbs, or shrubs; mostly deserts or dry foothills.—Subgenus OREGONIUM.

Involucres solitary, usually scattered.

Annuals; leaves mostly in a rosette at base.

Flowering branches mostly elongated.

Calyx glabrous; involucre (except the terminal) hugging the branches.

Plant compactly branching; outer calyx segments fan-shaped with strongly incurved sides20. *E. nidularium*.

Plant diffusely or strictly branched.

Involucre narrowly turbinate, glabrous or nearly so, the teeth prominent.

Petioles not winged; stems and leaves white-woolly.....

21. *E. gracile*.

Petioles conspicuously winged; stems and leaves less tomentose

22. *E. citharaeforme*.

Involucre cylindric, almost truncate, the teeth minute.

Stems, leaves and involucre white-woolly.....23. *E. virgatum*.

Stems glabrous, rarely a little woolly below.

Involucre $1\frac{1}{4}$ to $2\frac{1}{2}$ lines long.....24. *E. molestum*.

Involucre $\frac{1}{2}$ to $1\frac{1}{2}$ lines long.

Involucre 1 to $1\frac{1}{2}$ lines long, usually fluted and often obscurely constricted a little at tip.....

25. *E. vimineum*.

Involucre $\frac{1}{2}$ to $\frac{3}{8}$ line long, not fluted.....

26. *E. baileyi*.

Calyx densely hairy; involucre spreading a little from the branches.....

27. *E. dasyanthemum*.

Flowering branches not elongated.

Repeatedly and shortly forked; flowers yellow.....28. *E. mohavense*.

Bearing an irregularly compound umbel.....29. *E. truncatum*.

Perennials with densely leafy short woody stems.

Inflorescence racemose.

Leaves roundish, densely imbricated on the caudex.....30. *E. saxatile*.

Leaves not roundish.

Involucre scattered on the few elongated branches.

Involucre scattered, 2 to 3 lines long.....31. *E. elongatum*.

Involucre scattered or sometimes approximate towards the ends of the branches, 1 to $1\frac{1}{2}$ lines long.....32. *E. wrightii*.

Involucre secund and crowded on the short branchlets..33. *E. nodosum*.

Inflorescence cymose or paniculate.

Peduncles bearing a divaricately branched panicle.

Involucral teeth glabrous34. *E. heermannii*.

Involucral teeth pubescent35. *E. plumatella*.

Peduncles bearing corymbose cymes.....36. *E. microthecum*.

Involucres 2 to several in heads, rarely solitary; perennials.

Calyx-lobes similar or nearly so, nearly equal.

Not caespitose.

Shrubs, at least woody at base; stems very leafy, commonly fasciated.

Heads or involucre in a dense compound cyme; insular species.

I.—SUBGENUS *Ganysma*.

Involucres campanulate or broadly turbinate, not angled, never congested in heads, always borne on filiform and usually elongated pedicels and disposed in racemes or panicles, often drooping or recurved; bracts in 3s, small, rigid, mostly oblong to triangular; calyx often accrescent, not stipe-like at base; ovary and filaments glabrous; annuals (except nos. 9 and 10); mostly of the deserts or arid plains.

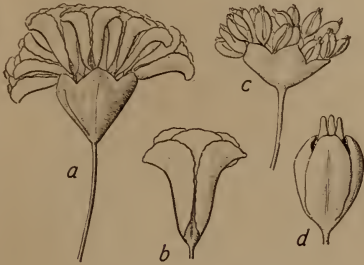


Fig. 72. *a*, *ERIOGONUM GRACILLIMUM* Wats., involucre; *b*, flower; *c*, *E. ANGULOSUM* Benth., involucre; *d*, flower. Involucres, $\times 4$; flowers, $\times 10$.

1. *E. angulosum* Benth. (Fig. 72c, d.) Stems diffusely and repeatedly dichotomous from near the base, 3 to 14 (or 24) inches high, the branches 4 to 6-angled; stems and leaves whitish tomentose, or glabrate and green; basal leaves roundish to broadly oblong or lanceolate, commonly undulate, $\frac{1}{2}$ to 1 inch long, on rather short petioles; upper leaves oblong to lanceolate or oblanceolate, sessile or nearly so; pedicels of the involucre 3 to 8 lines long, in the forks or terminal; involucre turbinate or hemispherical, 1 line long, minutely glandular, woolly inside; calyx segments white or pink, $\frac{1}{2}$ to $\frac{3}{4}$ line long, minutely glandular-puberulent, the outer

(with darker centre) obovate or ovate, concave, the inner linear or lanceolate, distinctly longer than the outer, all abruptly short-clawed.

South Coast Ranges to the upper San Joaquin Valley, Southern California, the Mohave Desert, and Inyo Co. Arizona to Washington. Lower California.

Var. *viridescens* Jepson n. comb. Leaves oval to elliptic; calyx greenish.—Kern Co. Possibly a seasonal abnormality.

Var. *maculatum* Jepson n. comb. Close to preceding; basal leaves oval, not revolute, $\frac{3}{4}$ to 1 inch long and $\frac{1}{2}$ to $\frac{3}{4}$ inch wide; involucre more deeply lobed; outer calyx segments yellowish with an oblong red blotch.—Desert valleys, Victor, Kramer and Barstow to Inyo Co. and north to Reno, Nev.

Refs.—*ERIOGONUM ANGULOSUM* Benth. Trans. Linn. Soc. 17: 406, t. 18, fig. 1 (1837), type from California, Douglas. Var. *flabellatum* Gand. Bull. Soc. Roy. Bot. Belg. 42: 187 (1905), east base of Sierra Nevada on Central Pacific R. R. Not seen by us. Var. *viridescens* Jepson. *E. viridescens* Heller, Muhl. 2: 25 (1905), type loc. Sunset, Heller 7733. Var. *MACULATUM* Jepson. *E. maculatum* Heller, Muhl. 2: 188 (1906), type loc. Laws, Inyo Co., Heller 8233.

2. *E. gracillimum* Wats. (Fig. 72a, b.) Stems many from the base, diffuse, repeatedly dichotomous and very slender above, 4 to 10 (or 24) inches high; herbage thinly woolly, especially on the under side of the leaves; basal leaves spreading, oblong to lanceolate, $\frac{3}{4}$ to $1\frac{1}{2}$ inches long, narrowed below, sessile or shortly petioled, the cauline sessile, erect, oblong-lanceolate, acute, blister-dilated, strongly revolute, $\frac{3}{4}$ to 1 inch long; involucre turbinate, borne on filiform pedicels 4 to 8 lines long; calyx pink, minutely glandular-hispid outside, 1 line long, the tips of the segments white and erosulate; outer segments broadly oblong, erect with the white tips abruptly spreading, the edges below the tips incurved; inner segments like the outer but smaller.

Sandy soil, Mohave Desert north to the upper San Joaquin Valley and west-erly to San Luis Obispo Co.

Locs.—Mohave Desert, Jepson 5322 (Kramer), 5615 (Victor); San Emigdio, Kern Co., Davy 1968; Santa Maria River, Blochman; Estrella, Jared.

Refs.—*ERIOGONUM GRACILLIMUM* Wats. Bot. Cal. 2: 480 (1880), type loc. Mohave Desert, Bush. *E. variable* Heller, Muhl. 2: 24 (1905), type loc. Mohave, Heller 7756. *E. angulosum* var. *victorensis* Jones, Contrib. 12: 74 (1908), type loc. Victor, Mohave Desert, Jones.

3. *E. gossypinum* Curran. Diffusely branched from the base, 4 to 10 inches high, thinly tomentose throughout or the upper parts glabrate; leaves oblanceolate, narrowed to a short petiole, or the upper oblong or lanceolate and mostly sessile, 1 to 2 inches long; involucre 1½ lines long, borne on pedicels 1 to 6 lines long, turbinate, cleft to the middle, glabrous outside, heaped inside with a cottony wool in which the 5 to 8 flowers are concealed; calyx ½ line long, obscurely puberulent, the outer segments oblong or spatulate, the inner linear, acuminate, longer.

Upper San Joaquin Valley. A remarkable species.

Locs.—Kern Co.: Oil City, Heller 7748; Caliente Creek, Davy 1885.

Refs.—*ERIOGONUM GOSSYPINUM* Curran, Bull. Cal. Acad. 1: 274 (1885), type loc. Bakersfield; Greene, Fl. Fr. 152 (1891).

4. *E. spergulinum* Gray. Stems erect, dichotomously branching, 4 to 11 inches high, minutely glandular pubescent or the upper half of the internodes usually glabrous; leaves linear, revolute, hairy, ½ to 1½ inches long, in whorls at the base of the stem and at the lower forks, reduced above to small bracts; involucre ¼ line long, deeply 4-toothed, on pedicels 3 to 6 lines long; bractlets none; calyx white with pink midveins, ¾ to 1¼ lines long, obscurely puberulent at base, the segments oblong-quadrate, erosulate at apex or merely acute.

Mountain slopes, North Coast Ranges and Sierra Nevada, 5000 to 9000 feet.

Locs.—Snow Mt., Lake Co., K. Brandegee; South Yollo Bolly, Jepson; Ash Creek, Siskiyou Co., M. S. Baker; Lassen Peak, Jepson 4071; Spanish Peak, Mrs. R. M. Austin; Summit, Nevada Co., Jepson; Yosemite, Lambert; Little Yosemite, Jepson 3152, 4402; Mt. Silliman, Jepson 716; near Mt. Whitney, Jepson 948; Alta Mdwa., Hopping 509; near Kaweah Peaks, Jepson 5008; Sky Valley, Tulare Co., Eastwood; Mt. Pinos, Hall 6659.

Refs.—*ERIOGONUM SPERGULINUM* Gray, Proc. Am. Acad. 7: 389 (1868), type loc. Big Creek, near Mariposa Grove, Bolander. *Oxytheca spergulina* Greene, Fl. Fr. 153 (1891). *O. reddingiana* Jones, Bull. Torr. Club, 9: 32 (1882), type loc. Soda Sprs. near Donner.

5. *E. hirtiflorum* Gray. Repeatedly dichotomously branched, 4 to 9 inches high, the stems lightly sprinkled with minute often stipitate glands, otherwise glabrous; leaves obovate, drawn down to a petiole-like base, sparingly hirsutulose, especially on the margins, ½ to 1½ inches long; involucre sessile along the branches and in the forks, or often on pedicels 1 to 3 lines long, narrow, 2-flowered; calyx reddish, ½ line long, its segments oblong, clothed with hooked hairs on the back; achene exserted.

Middle altitudes, Sierra Nevada and North Coast Ranges.

Locs.—Old Colony Mill, Jepson 626; Giant Forest and Ockenden, K. Brandegee; Coulterville, Jepson; Mariposa, Congdon; Bartlett's, Lake Co., T. Brandegee; Mt. Konocti, Jepson; Scott's Valley, Lake Co., J. P. Tracy 1650; Red Mt., Mendocino Co., Eastwood; Edgewood, Brandegee.

Refs.—*ERIOGONUM HIRTIFLORUM* Gray; Wats. Proc. Am. Acad. 12: 259 (1877), type loc. Tuolumne Co., Sierra Nevada, Gray. *Oxytheca hirtiflora* Greene, Fl. Fr. 153 (1891); Jepson, Erythraea, 1: 14 (1893), Fl. W. Mid. Cal. 151 (1901). A species closely connecting *Eriogonum* and *Oxytheca*, a reference to the latter genus satisfying in some respects its natural affinities. Such a reference would, however, also involve the transfer of its near allies, *E. spergulinum*, *inermis*, *apiculatum*, *ordii* and *parishii*.

6. *E. inermis* Jepson n. comb. Stems 1 to 3 from the base, repeatedly and divaricately dichotomous, 3 to 10 inches high; leaves in a basal rosette, broadly spatulate, ½ to 1 inch long, sessile, glabrous save the ciliate margin; bracts (2 or 3 lines long) and branches hispidulose-glandular; involucre 4-cleft nearly to the base, 3 to 6-flowered, shortly pedicelled (pedicels ¼ to ½ line long); flowers rose-color; calyx hispid, its hairs hooked at tip, at least in age; inner calyx segments smaller than the outer and retuse.

San Bernardino Mts. north to Monterey and San Benito cos. in the Coast Ranges and to Tulare Co. in the southern Sierra Nevada.

Locs.—Sequoia Mills, *Brandegee*; Middle Tule River, *Purpus* 1685; Havilah, Kern Co., *K. Brandegee*; Tehachapi, *K. Curran*; Priest Valley, Hernandez, and Pacific Valley, *Eastwood*.

Refs.—*ERIOGONUM INERME* Jepson. *Oxytheca inermis* Wats. Proc. Am. Acad. 12: 273 (1877), type from California, *Miss M. J. Bancroft*. *Eriogonum vagans* Wats. Proc. Am. Acad. 20: 370 (1885).

7. ***E. apiculatum*** Wats. Stems erect, trichotomously branching, $\frac{1}{2}$ to 2 feet high, the peduncles (2 to 4 lines long) in all the forks and terminal, the lower half of the internodes and peduncles somewhat glandular-pubescent; leaves in a basal cluster, obovate or oblanceolate, narrowed below to a petiole, 7 to 12 lines long, hirsute-glandular; involucre 1 to 3-flowered, glabrous, turbinate, nearly 1 line long, 4-lobed, the lobes oblong and as long as tube; pedicels spreading or even deflexed, 2 to 7 lines long; calyx red in the bud, white in flower, $\frac{3}{4}$ line long, puberulent outside, segments oblong-obovate, deeply notched with a slender point in the sinus, sometimes one or more merely truncate, obtuse or apiculate.

Mt. San Jacinto, 7800 to 8200 feet; Cuyamaca Mt. A dainty plant with peculiar calyx segments, closely allied to *E. parishii*.

Ref.—*ERIOGONUM APICULATUM* Wats. Proc. Am. Acad. 17: 378 (1882), type loc. Mt. San Jacinto, *Parish Bros.*

8. ***E. ordii*** Wats. Diffusely paniculate, $1\frac{1}{2}$ to $2\frac{1}{2}$ feet high, the lower parts thinly tomentose, or the leaves glabrate above; leaves in a rosulate basal cluster and in whorls at the lower nodes, roundish to obovate, $1\frac{1}{2}$ to 2 inches long, or the upper smaller, petioled; involucre 4-toothed, $\frac{1}{3}$ to $\frac{1}{2}$ line long, 1 to 3-flowered, on pedicels 3 to 9 lines long; calyx dull white or pinkish, densely pubescent outside, $\frac{1}{2}$ to $\frac{3}{4}$ line long, its segments ovate or oblong.

Caliente, Kern Co., *Davy* 1869; Split Mt., Colorado Desert, *Brandegee*; western Arizona.

Ref.—*ERIOGONUM ORDII* Wats. Proc. Am. Acad. 21: 468 (1886), type loc. Fort Mohave, Ariz., *Lemmon*.

9. ***E. parishii*** Wats. Stems 1 to 3, forming a diffusely branched panicle above the first node, 4 to 9 inches high, glaucous but somewhat viscid with stipitate glands; leaves in a basal cluster, broadly oblanceolate, hirsute, narrowed to a short petiole, $\frac{1}{2}$ to $1\frac{1}{2}$ inches long; pedicels 1 to 4 lines long; involucre 4-lobed at least to middle, $\frac{1}{3}$ line long, 1 or 2-flowered; calyx pinkish, minutely pubescent, $\frac{1}{2}$ line long, outer segments ovate, the inner oblong-stipitate.

Mountains of Southern and Lower California.

Locs.—San Bernardino Mts., *Abrams* 2983; Descanso, *Brandegee*.

Ref.—*ERIOGONUM PARISHII* Wats. Proc. Am. Acad. 17: 379 (1882), type loc. Bear Valley, San Bernardino Mts., *Parish Bros.*

10. ***E. trichopodum*** Torr. Annual or perennial; stems 1 or several from the base, erect, umbellately 3 to 11-forked at and above the first node, glabrous and glaucous, $\frac{1}{2}$ to $1\frac{1}{2}$ feet high; first internode often inflated upwards; leaves in a basal cluster, roundish, crinkly, hirsute-pubescent, 6 to 9 lines long on petioles 1 to $1\frac{1}{2}$ times as long; involucre minute ($\frac{1}{4}$ line long), 4-lobed, 2 to 4-flowered, on divaricately spreading hair-like pedicels 3 to 5 lines long; calyx yellow or greenish, densely white-hispidulose on back of the ovate segments, $\frac{1}{2}$ to $\frac{3}{4}$ line long; inner and outer segments alike and equal.

Colorado and Mohave deserts north to Inyo Co. and the San Carlos Range. East to Utah and Arizona.

Locs.—Twentynine Palms, *T. Brandegee*; Ludlow, *Jepson* 5506; Lanfair, *Maye Tennent*; Calico Mts., *Jepson* 5412; Antelope Valley, *Davy* 2222; Providence Mts., *T. Brandegee*; Little Lake, Inyo Co., *Hall & Chandler* 7354; Alcalde (*Zoe*, 4: 158).

Refs.—*ERIOGONUM TRICHOPODUM* ("trichopes") Torr. Emory's Recon. 151 (1848), type loc. mts. on the west side of the Colorado Desert. *E. trichopodum* Torr.; Benth. in DC. Prodr. 14:20 (1856).

11. *E. inflatum* Torr. & Frem. DESERT TRUMPET. (Fig. 73.) Annual or perennial; stems several from the base, repeatedly tri- and di-chotomous,



Fig. 73. *ERIOGONUM INFLATUM* Torr. & Frem. *a*, habit, $\times \frac{1}{4}$; *b*, calyx, showing the broad scarious margins of the inner segments, and the very narrow margins of the outer segments, $\times 12$.

forming a diffuse panicle, $\frac{1}{2}$ to 3 feet high, glabrous, glaucous; lower internodes, especially the lowest peduncle-like one, strongly or slightly inflated upwards or rarely not at all; leaves roundish or round-ovate, cordate at base, 4 to 12 lines long, sometimes to $1\frac{1}{2}$ inches long, short hirsute but green, on

petioles $\frac{1}{2}$ to 2 times as long; pedicels racemose and in the forks, divaricately spreading, 4 to 10 lines long; involucre 3 to 7-flowered, glabrous, turbinate, 5-toothed, $\frac{1}{2}$ line long, in age crowded with linear or oblong bractlets; calyx yellowish, 1 line long, all the segments densely whitish hispid along middle of back, the outer segments lanceolate, their edges revolute and thus becoming linear-lanceolate, the inner segments triangular-lanceolate, with scarious margins.

Colorado and Mohave deserts, north to the San Carlos Range; east to Utah and New Mexico.

Locs.—Coachella, *Greata*; east base Mt. San Jacinto, *Hall* 1834; Providence Mts., *T. Brandegee*; Ludlow, *Jepson* 5509; Randsburg, *Heller* 7693; Barstow, *Jepson* 4778; San Carlos Range, *Lillis*; Keeler, *Hall & Chandler* 7172; Southern Belle Mine, *Heller* 8333.

Refs.—*ERIOGONUM INFLATUM* Torr. & Frem., *Frem. Rep. Sec. Exped.* 317 (1845), type loc. Mohave Desert, *Fremont*; *Cov. Contrib. U. S. Nat. Herb.* 4: 186 (1893). *E. clavatum* Small, *Bull. Torr. Club*, 25: 50 (1898), type from n. Lower Cal., *Orcutt*. *E. glaucum* Small, l. c. 51, type loc. Colorado Desert, *Orcutt*.

12. *E. pusillum* T. & G. Stems 1 or several from the base, 4 to 12 inches high, trichotomously branched at or from below the middle, glabrous; leaves ovate or rounded, 3 to 8 lines long, tapering at base into the petiole, flocculent-tomentose below, less so above, the green bracts and involucre glandular-pubescent; pedicels of the involucre glabrous, filiform, 4 to 14 lines long, in all the forks of the trichotomous panicle and terminal; involucre broadly turbinate; calyx yellow, the segments with red centres, minutely pubescent, 1 line long, the outer segments obovate, the inner oblong; filaments included.

Mohave Desert and north to Inyo Co. Nevada.

Locs.—Little Rock Creek, Los Angeles Co., *Davidson*; Lancaster, *Davidson*; Victor, *Jepson* 5619; Calico Mts., *Jepson* 5394; Randsburg, *Heller* 7685; Bishop Creek, *Hall & Chandler* 7272; Kernville, *Brandegee*.

Ref.—*ERIOGONUM PUSILLUM* T. & G. *Proc. Am. Acad.* 8: 184 (1870), type loc. foothills of the Trinity Mts., Nev., *Watson*.

13. *E. reniforme* Torr. & Frem. Stems 1 to several from the base, 2 to 6-forked, forming a diffuse plant 4 to 7 inches high; herbage glabrous and glaucous except the leaves and the slightly hairy lower internodes; leaves all basal, round-reniform or roundish, 5 to 11 lines broad, loosely white-woolly; petioles $\frac{1}{2}$ to $2\frac{1}{2}$ inches long; bracts glabrous but the margins loosely hairy; involucre glabrous, turbinate-campanulate, on pedicels 2 to 6 lines long; calyx whitish or yellowish, minutely glandular-puberulent, $\frac{3}{4}$ line long, the outer segments ovate or elliptic, the inner broadly linear; filaments exserted.

Inyo Co. south to the Mohave and Colorado deserts. Lower California.

Locs.—Owens Lake, *Jepson* 5118; Keeler and Panamint Valley, acc. *Coville*; Ludlow, *Jepson* 5493; Barstow, *K. Brandegee*; Kramer, *Jepson* 5331; Victor, *Jepson* 5618; Twentynine Palms, *T. Brandegee* (involucre scarcely lobed).

Refs.—*ERIOGONUM RENIFORME* Torr. & Frem.; *Frem. Rep. Sec. Exped.* 317 (1845), type from California, *Fremont*, probably on the Mohave Desert; *Cov. Contrib. U. S. Nat. Herb.* 4: 188 (1893). *E. praebens* Gand. *Bull. Soc. Roy. Bot. Belg.* 42: 196 (1905), Sierra Valley, *Hillman*.

14. *E. thomasi* Torr. (Fig. 74.) Stems 1 or several from the base, repeatedly and diffusely 2 to 8-forked, 4 to 8 inches high; leaves in a basal tuft, roundish, sometimes subcordate at base, 2 to 8 lines long, rather long-petioled, white-woolly or glabrate; pedicels in the forks and terminal, 2 to 9 lines long; involucre deeply 5-lobed, $\frac{1}{2}$ line long, glabrous; calyx dull yellow, $\frac{1}{3}$ to $\frac{1}{2}$ line long, in age whitish and twice as long, hispidulose outside at base, the outer seg-



a



b

Fig. 74. *ERIOGONUM THOMASII* Torr. a, flower in anthesis, x 12; b, flower, fruiting stage.

ments ovate, the margin in age saccate-dilated on each side of the cordate base, the inner segments linear-spatulate, finally exceeding the outer.

Colorado Desert, north to Inyo Co. East to Arizona and Utah.

Locs.—Calexico, *Abrams* 3152; Chuckawalla Spr., *Hall* 5899; Coachella, *Hall* 5812.

Refs.—*ERIOGONUM THOMASII* Torr. in *Pac. R. Rep.* 5²: 364 (1857), type loc. Ft. Yuma, *Major Thomas*. *E. minutiflorum* Wats. *Proc. Am. Acad.* 26: 125 (1891), type loc. Colorado Desert, *Orcutt*, Apr. 1890, the segments less strongly saccate, otherwise the same.

E. DESERTICOLUM Wats. *Proc. Am. Acad.* 26: 125 (1891), type loc. s.w. Colorado Desert, *Orcutt* 2189. Calyx yellow, villous. Very obscure; collected only once.



Fig. 75. *ERIOGONUM THURBERI* Torr.
a, flowering branchlet, x 1; b,
flower, x 10.

15. *E. thurberi* Torr. (Fig. 75.) Stems 1 or several from the base, diffusely and trichotomously branched, 4 to 13 inches high, tomentulose towards the base; leaves in a basal rosulate cluster, ovate to broadly oblong, woolly below, less so above, $\frac{1}{2}$ to 2 inches long, the petioles about as long or longer; peduncles in the forks and terminal, 2 to 12 lines long; involucre 1 line long, nearly hemispherical; calyx rose-red or white, $\frac{1}{2}$ to $\frac{3}{4}$ line long; outer calyx segments roundish or transversely elliptic, abruptly narrowed to a broad claw, a floe of wool at summit of claw; inner calyx segments narrowly linear or lanceolate, somewhat hastately lobed near base, $\frac{1}{4}$ as wide as outer segments.

San Bernardino Valley south to San Diego Co. and Lower California, east to Arizona.

Locs.—San Bernardino Valley, *Parish*, *Jepson* 5563; Palm Cañon, Mt. San Jacinto, *Jepson* 1401; Temecula River, *Jepson* 1553.

Refs.—*ERIOGONUM THURBERI* Torr. *Bot. Mex. Bound.* 176 (1859), type loc. San Pasqual, San Diego Co., *Thurber*. *Var. parishii* Gand. *Bull. Soc. Roy. Bot. Belg.* 42: 198 (1905), type loc. San Bernardino, *Parish* 2820.

16. *E. cernuum* Nutt. Stems glabrous, glaucous, diffusely di- or tri-chotomously branched, 6 to 14 inches high; leaves round to oval, white woolly below, glabrate above, 6 to 9 lines long, the petioles nearly as long; pedicels deflexed, $\frac{1}{2}$ to 4 (or 7) lines long, somewhat racemose on the branches; involucre narrowly turbinate; calyx white, glabrous, $\frac{3}{4}$ to 1 line long, narrowed to a shortly clavate base, its segments obovate or somewhat quadrate, undulate, retuse, the inner half as broad.

Colorado Desert (Warren's Well, *Brandege*). North to Nevada and Oregon, east to the Rocky Mts.

Ref.—*ERIOGONUM CERNUM* Nutt. *Jour. Acad. Phila.* ser. 2, 1: 162 (1848), types from Columbia River plains and in the Rocky Mts., *Nuttall*.

17. *E. nutans* T. & G. Similar to *E. cernuum* but pedicels glandular; base of calyx very obtuse (attenuate in *E. cernuum*).

Northwestern Nevada. Lassen Co. acc. *Bot. Cal.* 2: 23.

Ref.—*ERIOGONUM NUTANS* T. & G. *Proc. Am. Acad.* 8: 181 (1870), type spms. from Lassen Co. and n.w. Nev.

18. *E. watsonii* T. & G. Similar to *E. cernuum*; stem sometimes a little inflated; branches erect; leaves round-cordate; pedicels divaricately spreading, 1 to 4 lines long; calyx segments oblong, subcordate at base.

Lockwood Valley, Mt. Pinos, *Dudley & Lamb* 4683; thence easterly to Nevada. An ill-defined species so far as the Californian material is concerned, apparently passing into *E. deflexum*.

Locs.—Tehachapi, *Stokes*; Walker Pass, *Brandege*.

Refs.—*ERIOGONUM WATSONII* T. & G. *Proc. Am. Acad.* 8: 182 (1870), type loc. Humboldt Mts., Nev. *E. baratum* Elmer, *Bot. Gaz.* 39: 52 (1905), type loc. betw. Griffin and Mt. Pinos, *Elmer* 3593.

19. *E. deflexum* Torr. SKELETON WEED. (Fig. 76.) Stems 1 or several from the base, glabrous and green, 5 to 13 inches high, divaricately branched, the internodes short and branching, intricate, or sometimes simpler with elongated branchlets; leaves in a basal rosette, round-obcordate, whitish tomentose, $\frac{1}{2}$ to $1\frac{1}{2}$ inches long, the petioles half to twice as long; involucre campanulate or broadly turbinate, $\frac{1}{2}$ to 1 line long, with 4 short broad obtuse lobes, on pedicels $\frac{1}{4}$ to 1 (or rarely 2) lines long, more or less deflexed; calyx white, or turning pink, glabrous, $\frac{1}{2}$ to 1 line long, the outer segments elliptic or elliptic-ovate, very obtuse, cordate at base, the inner narrowly ovate-acuminate, shorter than the outer, half as wide.

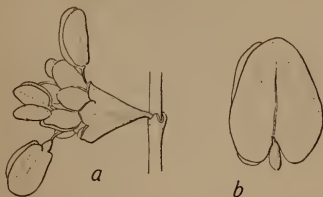


Fig. 76. *ERIOGONUM DEFLEXUM* Torr. *a*, involucre, x 5; *b*, flower, x 10.

Desert washes and flats, Colorado and Mohave deserts north to Inyo Co. Nevada, Arizona.

Locs.—Caleb, *Parish* 8290; Calexico, *Abrams*; Chuckawalla Mts., *Mrs. F. Stephens*; Palo Verde Valley, *Hall* 5953; Riverside Mts., *Jepson* 5235; Victor, *Jepson* 5613.

Refs.—*ERIOGONUM DEFLEXUM* Torr. in Ives, Rep. Colo. River, Bot. 24 (1860), type loc. Three Point Bend, Chocolate Mts., Colorado River, *Newberry*. *E. brachypodum* T. & G. Proc. Am. Acad. 8: 180 (1870), type loc. Kingston Spr., Kingston Mts., *Remy*; differs only in being slightly glandular hairy; ranges into southern Nev. Various Californian specimens in Californian herbaria are labeled as *E. hookeri* Wats. (Proc. Am. Acad. 14: 295,—1879, type locs. Wahsatch Mts. and w. Nev.), as *E. insigne* Wats. (Proc. Am. Acad. 14: 295,—1879, type loc. Red Creek, s. Utah, *Palmer* 431 in 1877), or as *E. parryi* Gray (Proc. Am. Acad. 10: 77,—1874, type loc. s. Utah, *Parry* 239). This Californian material is, however, not sufficiently distinguishable by the diagnoses referred to and we must at this time regard the specimens in question as variants of *E. deflexum*.

II.—SUBGENUS *Oregonium*.

Involucres cylindric or cylindric-turbinate, 5-toothed, 5 or 6-nerved or angled, always sessile, solitary or congested in heads, always erect; bracts on the flowering branches in 3s, connate at base; calyx not at all or little accrescent, not stipe-like at base; ovary and filaments mostly glabrous; annuals, perennial herbs, or shrubs; mostly of deserts or arid foothills.

20. *E. nidularium* Cov. (Fig. 77.) Stems 1 or many from the base, repeatedly and regularly dichotomous, the forks short, making a dense mass of intricate branches which in well-grown plants curve in at maturity and suggest resemblance to a bird's nest; whole plant cobwebby-tomentose, often reddish in age, 3 to 8 inches high; leaves roundish ovate to orbicular and subcordate, 3 to 6 lines long, the petioles 1 to $2\frac{1}{2}$ times as long; involucre sessile in all the forks and along the branches, $\frac{1}{2}$ line long; calyx red, white or yellowish, glabrous, $\frac{3}{4}$ to 1 line long; outer segments somewhat quadrate, dilated at the truncate apex, the sides incurved; inner segments similar but narrower; ovary glabrous, scabrous on upper part.



Fig. 77. *ERIOGONUM NIDULARIUM* Cov.; flower, x 12.

Desert area: San Bernardino and Inyo cos. Nevada.

Locs.—Victor, *Jepson* 5620; Barstow, *Jepson* 4836, 5391; Lanfair, *Maye L. Tennent*; New York Mts., *Connor*; Lone Pine Creek, *Hall & Chandler* 7197; White Mts., *Heller* 8306.

Plants 6 to 8 inches high often develop 15 to 25 stems from near the base, which fork and refork 4 to 10 times and produce 1000 to 1200 terminal branchlets. As the forks grow they become intricately interlocked and it is impracticable to divide the plant except by tearing it forcibly apart.

Refs.—*ERIOGONUM NIDULARIUM* Cov. Contrib. U. S. Nat. Herb. 4: 186 (1893), type loc. Panamint Mts., *Coville* 963. *E. plumatella* of Bot. Cal. 2: 31 (1880).

21. *E. gracile* Benth. Stems strictly branched and forming a narrow panicle or more diffuse, $\frac{1}{2}$ to $2\frac{1}{2}$ feet high; thinly tomentose throughout, becoming floccose; leaves oblanceolate or broadly oblong, attenuate to a slender petiole, $\frac{1}{2}$ to 2 inches long, tomentose on both sides or less so above; bracts more or less elongated, equaling nearly or quite the involucre, or the lower somewhat foliaceous; involucre along the elongated branches, glabrous or nearly so, barely exceeding the bracts and half concealed by them, $\frac{3}{4}$ to 1 line long, cylindric-campanulate, the teeth acute, prominent, spreading; calyx white, rose-color or yellowish, glabrous, $\frac{3}{4}$ line long.

Dry plains, valleys and low hills. Great Valley and Coast Ranges to Southern California. Lower California.

Locs.—Witch Creek, *Alderson*; Riverside, *Zumbro*; San Bernardino, *Parish* 3822; Los Angeles, *E. D. Palmer*; Antelope Valley, *Lyell*; Soledad, *Congdon*; Lathrop, *K. Brandegee*; Vaca Mts., *Jepson*.

Refs.—*ERIOGONUM GRACILE* Benth. Bot. Sulph. 46 (1844), type loc. San Pedro, *Hinds*; Jepson, Fl. W. Mid. Cal. 154 (1901). *E. agninum* Greene, Pitt. 2: 165 (1891), type loc. Santa Inez Mts., n. slope.

22. *E. citharaeforme* Wats. Stems 1 or several from the base, freely branching, 1 to 3 feet high; herbage thinly tomentose, glabrous or glabrate above; leaves in a basal rosette, or a few at the lower nodes, roundish to ovate, $\frac{3}{4}$ to 2 inches long, gradually or cordately contracted to a long winged petiole, the wing crenulately toothed, attenuate downward; involucre turbinate, $1\frac{1}{2}$ lines long.

San Luis Obispo Co. east to the inner South Coast Ranges. A local and indefinitely known species. Perhaps only a variety of *E. virgatum*.

Ref.—*ERIOGONUM CITHARAEFORME* Wats. Proc. Am. Acad. 23: 266 (1888), type loc. Baron Schroeder's Ranch, Santa Margarita, *Lemmon* 1584.

23. *E. virgatum* Benth. Tomentose throughout, stem slender, erect, simple, or the few branches rather strict, 1 to 3 feet high; leaves in whorls on lower part of stem or rosulate at the base, oblanceolate (or obovate), $\frac{1}{2}$ to 2 inches long, on slender petioles, the margin usually undulate; involucre 2 to $2\frac{1}{2}$ lines long, rather remote, tomentose, cylindric, truncate or nearly, the teeth minute; bracts lanceolate, shorter than the involucre; calyx glabrous, 1 line long, white, buff, sulphur-yellow or pink.

Stream beds: Coast Ranges; Sierra Nevada, 500 to 5000 feet.

Locs.—Quartz Valley, Siskiyou Co., *Butler* 203; Hy-am-pum, *Chesnut & Drew*; Middle Creek, Lake Co., *Tracy* 2358; Cloverdale, *Jepson*; Putah Creek, *Jepson*; Walnut Creek, *Jepson*; Los Buellis Hills, Santa Clara Co., *R. J. Smith*; New York Falls, Amador Co., *Hansen* 163; San Andreas, *Jepson*; Crocker, Yosemite Park, *Jepson* 4636; Coulterville, *Jepson*; Redwood Cañon, E. Fork Kaweah River, *Jepson* 1159; S. Fork Kaweah River, *Culbertson* 4404; Upper Grouse Valley, Tulare Co., *Jepson* 4707; Tehachapi, *Stokes*; Griffin, Ventura Co., *Hall* 6335.

Refs.—*ERIOGONUM VIRGATUM* Benth. in DC. Prodr. 14: 16 (1856), type from California, Fremont. *E. roseum* Dur. & Hilg. Pac. R. Rep. 5: 14, pl. 15 (1855), type loc. Posé Creek, Kern Co., *Heermann*; lower nodes of panicle leafy; flowers rose-red.

24. *E. molestum* Wats. Habit of *E. vimineum*, glabrous and glaucous above the white-woolly leaves; leaves roundish or cordate, crisped or undulate, 4 to 6 lines long; flowers white, $\frac{3}{4}$ to 1 line long; involucre cylindric-turbinate, $2\frac{1}{2}$ lines long; ovary scaberrulous.

San Gabriel, San Bernardino and San Jacinto mountains to San Diego.

Var. *davidsonii* Jepson n. comb. Habit and foliage of *E. molestum* but involucre only $1\frac{3}{4}$ lines long, cylindric-prismatic; bracts more united and cup-like.—San Gabriel Mts. to the San Jacinto Mts.

Refs.—*ERIOGONUM MOLESTUM* Wats. Proc. Am. Acad. 17: 379 (1882), type spms. from mountains of S. Cal. Var. *DAVIDSONII* Jepson. *E. davidsonii* Greene, Pitt. 2: 295 (1892), type loc. Wilson Peak, *Davidson*.

25. *E. vimineum* Dougl. (Fig. 78b.) Stems 1 or several, glabrous wholly or at least above the base, erect, 3 to 18 inches high, much branched from

near the base, the branches elongated and virgate, with the lower often in whorls of 3 to 5; lower forks sometimes leafy; leaves orbicular to broadly ovate, 3 to 12 lines broad, greenish, reddish, or yellowish, white tomentose below, the margin undulate, at least in age, the petioles 1 to 3 times as long;



Fig. 78. a, *ERIOGONUM DASYANTHEMUM* T. & G.; involucre. b, *E. VIMINEUM* Dougl.; involucre, x 5.

involucres very narrow, cylindric, strongly angled, 1 to $1\frac{1}{2}$ lines long; flowers rather few, rose-color, or yellowish, glabrous, 1 line long; outer calyx segments obovate, rounded at apex, the inner oblong.

Coast Range hills, especially slopes near rocky outcroppings.

Locs.—Napa Valley, *Jepson* 2976; Howell Mt., *Brandegge*; Mt. St. Helena, *Jepson*; Blue Lakes, Lake Co., *Jepson*; Mt. Konocti, *Jepson*; Willow Creek, Humboldt Co., *Tracy* 3451; Shasta Sprs., *Jepson*; Yreka, *Butler* 1572; Scott Valley, *Sis-*

kiyou Co., *Jepson* 2957; Dixey Valley, Lassen Co., *M. S. Baker*; Belden, Feather River, *Jepson* 4151; Ione, *Braunton* 1166.

Var. *elegans* *Jepson* n. comb. Stem for a half-inch at base densely clothed with white-woolly obovate small leaves; involucres turbinate; calyx rose-red or whitish, $\frac{1}{2}$ line long.—San Luis Obispo Co.

Var. *caninum* *Greene*. Stems several from the base, procumbent or very diffuse, repeatedly di- or at first tri-chotomous, with short forks and branchlets, or the stem sometimes solitary, erect and branching only at the first node; inflorescence and stems reddish; involucres narrowly turbinate, mostly at the ends of the short branches or sessile in the forks; calyx rose-red.—Oakland Hills; Marin Co.; Monterey Co.

Refs.—*ERIOGONUM VIMINEUM* Dougl.; Benth. Trans. Linn. Soc. 17: 416 (1837), type from the Columbia River, *Douglas*. Var. *californicum* Gand. Bull. Soc. Roy. Bot. Belg. 42: 199 (1905), type loc. Petaluma, *Tidestrom*. *E. luteolum* *Greene*, Pitt. 3: 200 (1897), type loc. Napa Valley, *Greene*. Var. *ELEGANS* *Jepson*. *E. elegans* Pitt. 2: 173 (1891), type loc. upper Salinas River, *A. Norton*. Var. *CANINUM* *Greene*, Fl. Fr. 150 (1891), type loc. Tiburon, *Greene*. *E. nortoni* *Greene*, Pitt. 2: 165 (1891), type loc. Gonzales, Monterey Co., *A. Norton*.

26. *E. baileyi* *Wats*. Diffusely branched from the base, glabrous, 5 to 12 inches high, and half again as broad, with something of the delicate or slender habit of *E. gracile*; leaves roundish to ovate, white-woolly; involucres cylindric or a little enlarged upwards, $\frac{1}{2}$ to $\frac{7}{8}$ line long; calyx lemon yellow or whitish, delicately glandular, $\frac{2}{3}$ line long; outer segments ovate or oblong, the inner smaller, narrowly ovate; body of achene lenticular, strongly beaked.

Desert valleys: Mohave Desert north to Inyo Co. and western Nevada; Arizona to Washington.

Var. *brachyanthum* *Jepson* n. comb. Stems usually greenish rather than pale or glaucous, at base with a persistent lanate zone; internodes shorter and relatively stouter; bracts redder; calyx glabrous in age, usually constricted a little at middle and flaring at tip, as often in the species.—Mohave Desert north to Inyo Co. Well-grown plants recall in miniature the habit of a Texas Umbrella Tree.

Locs.—Victor, *Jepson* 5614; Barstow, *Jepson* 5241; Olancho, *Jepson* 5131; Alabama Hills, *Jepson* 915; Cottonwood Creek, *Purpus* 3034; Indian Wells, *Purpus* 3030.

Var. *tomentosum* Wats. Stems thinly tomentose.—San Bernardino Mts. Of doubtful affinity.

Refs.—*ERIOGONUM BAILEYI* Wats. Proc. Am. Acad. 10: 348 (1875), type spms. from desert valleys east of the Sierra Nevada. Var. *BRACHYANTHUM* Jepson. *E. brachyanthum* Cov. Contrib. U. S. Nat. Herb. 4: 185 (1893), type loc. Indian Wells, Inyo Co., Coville. Var. *TOMENTOSUM* Wats. Proc. Am. Acad. 12: 268 (1876).

27. *E. dasyanthemum* T. & G. (Fig. 78a.) Stems thinly tomentose or soon glabrate, 1 to 2 feet high, branching from or near the base, and often bush-like in habit; leaves roundish, plane, tomentose below, less so above, $\frac{1}{2}$ to $1\frac{1}{2}$ inches long, abruptly contracted to a slender petiole half to as long; involucre 1 or 2 in a place, rather remote, cylindric, 2 lines long, tomentose between the callous ribs; calyx white or red, 1 line long, densely hairy on outside, glabrous inside; filaments glabrous or slightly pubescent at very base.

Low dry hills, inner Coast Range from the Vaca Mts. to Lake Co. and north to the Yollo Bollys. Sept.-Nov. This seems quite to replace *E. vimineum* of the middle North Coast Range.

Locs.—Vaca Mts., Jepson; Knoxville grade, Jepson; Guinda, Rowena Beans; Sulphur Bank, Lake Co., Agnes Bowman; Yollo Bolly, Brandege.

Refs.—*ERIOGONUM DASYANTHEMUM* T. & G. Proc. Am. Acad. 8: 177 (1870), type loc. Clear Lake, Bolander, Torrey. Var. *jepsonii* Greene, Fl. Fr. 150 (1891), type loc. Gates Cañon, Vaca Mts., Jepson in 1887.

28. *E. mohavense* Wats. Stems 1 or several from the base, repeatedly tri- and di-chotomously branched, 4 to 12 inches high, glabrous or a little hairy at the nodes; branches green, bracts often red; leaves in a rosulate basal cluster, roundish or ovate, 2 to 6 lines long, abruptly narrowed to a slender petiole; involucre turbinate-bellshaped, very shortly 5-toothed, glabrous outside, a hairy ring inside at throat, $\frac{3}{4}$ line long, sessile in the forks and terminal on the short branchlets; calyx yellow, glabrous, $\frac{1}{2}$ line long, the outer segments oblong or elliptic, the inner segments sometimes white, half as broad; achene partly exserted.

Dry hills, Mohave Desert. Involucres almost flaring just at mouth. Remarkable for the small size of its flowers.

Locs.—Lancaster, K. Brandege; Kramer, Jepson 5321, 5337; Barstow, Jepson 4818; Indian Wells, Hall & Chandler 7367.

Refs.—*ERIOGONUM MOHAVENSE* Wats. Proc. Am. Acad. 12: 266 (1877), type loc. Mohave Valley, Palmer. *E. delicatulum* Wats. Proc. Am. Acad. 17: 379 (1882), type loc. Mohave Desert, Parry; "Resembling *E. mohavense* but smaller and more slender, with narrower and less strongly nerved involucre and the achenes exserted."—Not known to us.

29. *E. truncatum* T. & G. Stems mostly several from the base, thinly tomentose or glabrate, 6 to 15 inches high, naked, bearing a leafy-bracted irregular umbel; leaves obovate or oblong-oblancheolate, with undulate margin, 1 to 2 inches long, attenuate to a slender petiole nearly as long; umbel of 3 to 6 elongated unequal rays loosely once or twice di- or tri-chotomous; bracts almost minute; involucre 2 to 4 in a cluster or solitary, tomentose, oblong-turbinate, 2 lines long; calyx light rose-color, glabrous, $1\frac{1}{3}$ lines long; filaments pubescent at very base.

East base of Mt. Diablo north to Antioch. The sinuses between the involucral teeth are completely filled by a membrane so that the involucre is truncate.

Var. *adsurgens* Jepson n. comb. (*E. adsurgens* Stokes in hb.) Leaves roundish, 5 to 11 lines broad, abruptly long-petioled; involucre turbinate, 1 line long, obviously toothed.—(*Folia suborbicularia*, lin. 5-11 lata, abrupte longo-petiolata; involucrea turbinata, linea longa, subdentata.)—Inner South Coast Range from Warthan, Eastwood, May 11, 1893, type, to Hernandez, Eastwood.

Ref.—*ERIOGONUM TRUNCATUM* T. & G. Proc. Am. Acad. 8: 173 (1870), type loc. Mt. Diablo, Brewer. The exact station for the type is "Dry hillsides at Marsh's Ranch" at east

base of Mt. Diablo (see type sheet in Gray Herbarium) and not "summit of the eastern peak."

30. **E. saxatile** Wats. Flowering stems erect, naked, paniculately 1 or 2-forked, tomentulose, $\frac{1}{4}$ to 1 (or 2) feet high, arising from a woody caudex; caudex simple or branched, 2 to 5 inches high, densely crowded or even imbricated with leaves; leaves covered with a dense silvery felt, roundish to round-ovate, shortly acute, $\frac{1}{4}$ to 1 (or $1\frac{1}{2}$) inches long, shortly petioled; involucre tomentulose, $1\frac{1}{2}$ to 2 lines long, scattered along the branches of the panicle; calyx white or pale yellowish, glabrous, 3 to 4 lines long, gradually narrowed to a stipe-like 3-angled or 3-carinate base as long as the segments; inner calyx segments obovate, rather exceeding the narrower outer ones; filaments hairy at very base.

Mountain sides, 3000 to 8500 feet: Southern California, north in the Sierra Nevada to the Kaweah River and in the Coast Ranges to the Santa Lucia Mts.

Locs.—Mt. San Jacinto, *Hall* 2324; San Bernardino Mts. (Little Bear Valley), *Hall* 1005, 1294; Pabute Peak, *Purpus* 5325; Kernville and Sequoia Mills, *Brandegee*; Big Arroyo, Kern River, *Jepson* 4989; Santa Lucia Mts., *Jepson* 4737; Mt. Hamilton (Erythraea, 1:84).

Refs.—*ERIOGONUM SAXATILE* Wats. Proc. Am. Acad. 12: 267 (1877), type specimens from San Bernardino Mts., *Parry*, and Santa Lucia Mts., *Palmer*. Var. *bloomeri* Wats.; *Parish*, *Erythraea*, 6: 88 (1898), type loc. San Bernardino Mts., *Parish* 1664, 3785; *E. bloomeri* *Parish*, l. c. 87. *E. stokesae* Jones, Contrib. 8: 39 (1898), type loc. Pleasant Cañon, Panamint Mts., *Jones*.

31. **E. elongatum** Benth. Flowering stems erect, slender, leafless, simple or strictly branching, 1 to 4 feet high, arising from a branching base composed of leafy stems 3 to 9 inches high; herbage whitish-tomentulose throughout, the leaves beneath densely white-tomentose, above glabrate; leaves scattered or congested, ovate to oblong-lanceolate, acute, the margin undulate, 1 to $1\frac{1}{2}$ inches long, narrowed to a short petiole; involucre remotely scattered along the elongated stems or branches, cylindric, $3\frac{1}{2}$ lines long, truncate or obscurely toothed; calyx white, glabrous save a little hairiness on midveins inside, $1\frac{1}{2}$ lines long, its segments obovate, obtuse, the inner slightly longer than the outer; filaments glabrous.

Mountain sides and cañons near the coast from Monterey Co. to San Diego and east to Banning. Lower California.

Locs.—San Bernardino, *Parish* 4203; Claremont, *Elizabeth Palmer*; Leonis Valley, *Davy*; Santa Lucia Mts., *Jepson* 2588 (Big Sur River), 4736 (Santa Lucia Peak).

Ref.—*ERIOGONUM ELONGATUM* Benth. Bot. Sulph. 45 (1844), type loc. San Pedro.

32. **E. wrightii** Torr. Flowering stems several, 4 to 12 inches high, arising from a much-branched woody base with erect very leafy short branches; leaves obovate or oblanceolate, acute, white-tomentose, 2 to 6 lines long, short-petioled, often with smaller ones fascicled in the axils, or the lowermost twice as long with longer petioles; peduncles short, once or twice di- or trichotomous, the branches erect and rather strict; involucre scattered along the branches or congested towards the ends, campanulate-tubular, prominently but obtusely angled and woolly between the angles; calyx white or pink, $1\frac{1}{2}$ lines long, its segments obovate, rounded at apex, the inner longer than the outer.

Stream beds or mountain slopes: Sierra Nevada, Coast Ranges towards the interior, and Southern California. East to Texas.

Locs.—Putah Creek, *Jepson*; Corral Hollow, *Brewer* 846; Donner Lake, *Heller* 7165; between Glenbrook and Carson, *K. Brandegee*; Silliman Creek, Tulare Co., *K. Brandegee*; Soda Cañon, Sawtooth Range, *Jepson* 1112; Little Kern, *Purpus* 2099; Lanfair, Mohave Desert, *Maye L. Tennent*.

Var. *subscaposum* Wats. Leafy branches short, forming a close dense mat with short flowering stems; calyx smaller, with the segments less narrowed at base.—High montane.

Locs.—Mt. San Jacinto, *Hall* 816; San Bernardino Mts., *Blasdale*; Antimony Mt. near San Emigdio, *Brandege*; Mineral King, *Brandege*; Sequoia Park, *Fry*; S. Fork San Joaquin River, *Hall & Chandler* 639; Sentinel Dome, Yosemite, *Jepson* 5647; Donner Lake, *Heller* 7165.

Var. **membranaceum** Stokes in hb. Petioles dilated at base into a sheath clasping the stem; leaves glabrate above; sheaths soon glabrate, $\frac{1}{2}$ to 1 line long.—(Petiolata basi ochreate; ochreae glabrescentae, lin. $\frac{1}{2}$ -1 longae; folia supra glabra.)—Southern California mountains.

Locs.—Julian, *Dunn*; Cuyamaca Peak, *Brandege*; Mt. San Jacinto, *Vanderventer*.

Refs.—*ERIOGONUM WRIGHTII* Torr.; Benth. in DC. Prodr. 14: 15 (1856), type w. Texas, *Wright*. *E. trachygonum* Torr. in DC. Prodr. 14: 15 (1856), type coll. in California by Wilkes Exped.; *Jepson*, Fl. W. Mid. Cal. ed. 2, 133 (1911). *E. wrightii* var. *trachygonum* *Jepson*, Fl. W. Mid. Cal. 154 (1901). Var. *SUBSCAPOSUM* Wats. Bot. Cal. 2: 29 (1880). *E. curvatum* Small, Bull. Torr. Club, 25: 50 (1898), type loc. Long Mdw., Tulare Co., *Dr. Palmer* 207. *E. junceum* Greene, Leaflets, 1: 77 (1904), type loc. Kern Cañon, *Culbertson* 4396, the wire-like peduncles and the involucre soon glabrate but not otherwise different.

33. **E. nodosum** Small. Stems several from the base, tri- or di-chotomously branching, leafy below, $\frac{3}{4}$ to $1\frac{1}{4}$ (or " $3\frac{1}{2}$ ") feet high, white-tomentulose; involucre turbinate-cylindric, $1\frac{1}{2}$ lines long, sessile and unilaterally crowded on the ultimate ($\frac{1}{2}$ to 1 inch long) branchlets or pedicellate in the forks; calyx glabrous, $1\frac{1}{2}$ lines long, parted about half-way, the base coriaceous; outer segments roundish, notched at apex, the inner similar, half as broad; filaments pilose below the middle; achene minutely scaberulous.

Desert region: White Mts., Inyo Co.; Imperial Co. Nevada; Lower California.

Ref.—*ERIOGONUM NODOSUM* Small, Bull. Torr. Club, 25: 49 (1898), type loc. Dos Cabezas (near Coyote Well, Colorado Desert), *Orcutt* 1462.

34. **E. heermannii** Dur. & Hilg. Stems woody at base, leafy below, soon branching into a panicle, $1\frac{1}{2}$ to 2 feet high; peduncle of the panicle short, repeatedly 2 or 3-forked and finally ending in somewhat spinescent branchlets; forks of the panicle rather short but straightish, rigid, somewhat divaricate, as if fistulous and a little constricted at the joints; plant flocculent or glabrate on lower part, glabrous above; leaves oblong, 6 to 8 lines long, petioled; involucre hemispherical or broadly turbinate, 1 line long, the broad rounded lobes scarious-margined and overlapping at the sinuses; calyx 1 to $1\frac{1}{4}$ lines long, glabrous, the outer segments orbicular, the inner oblong, much narrower.

Mohave Desert northward to the southern Sierra Nevada and west to Mt. Pinos, *Hall* 6737. Nevada.

Ref.—*ERIOGONUM HEERMANNII* Dur. & Hilg. Pac. R. Rep. 5*: 14, pl. 17 (1885), type loc. Posé Creek, Kern Co., *Heermann*.

E. SULCATUM Wats. Proc. Am. Acad. 14: 296 (1879). Very similar; branches of the panicle angular, minutely scabrous.—Utah; Nev. To be looked for in the Death Valley region. Cf. var. *argense* Jones, Contrib. 11: 15 (1903), type loc. Argus Mts.

35. **E. plumatella** Dur. & Hilg. Stems woody at base, 1 to 2 feet high, the branches straightish or zig-zag, covered with a dense thin tomentum; forks (or internodes) of the panicle short, somewhat curved, continuously divaricate so that the inflorescence eventually appears almost contorted; involucre narrowly campanulate, glabrous outside, the teeth pubescent inside, not scarious margined; calyx white or pinkish, $\frac{2}{3}$ line long; outer segments obovate, truncatish, inner obovate, rounded or subacute, all cuneate at base; filaments a little hairy at base; beak of the ovary 3-angled, roughish.

Southern Sierra Nevada (Walker Pass acc. *Coville*) and south into the Mohave Desert (Lanfair, *Maye L. Tennent*). Flowers in rather small and compact clusters towards the ends of the rather long panicle branches.

Refs.—*ERIOGONUM PLUMATELLA* Dur. & Hilg. Pac. R. Rep. 5*: 14, pl. 16 (1855), type loc. Posé Creek, Kern Co., *Heermann*; Cov. Contrib. U. S. Nat. Herb. 4: 187 (1893). *E. palmeri* Wats. Proc. Am. Acad. 12: 267 (1877), type spms. from Julian and San Felipe in San Diego Co. and s. Utah, *Palmer*.

36. *E. microthecum* Nutt. Stems woody at base, diffusely but shortly branched, 4 to 10 inches high, whitish tomentulose throughout or the leaves above and the stems and involucres glabrate; leaves oblong-spatulate to elliptic, sometimes revolute, 4 to 8 lines long, shortly petioled; peduncles 1 to 4 inches long, bearing a small cymosely branched compound umbel; involucres sessile, those in the axils pedicellate, narrowly campanulate, $1\frac{1}{2}$ lines long, shortly toothed; calyx white, pink or yellow, glabrous, 1 to $1\frac{1}{2}$ lines long, its lobes about equaling the tube; outer lobes round, often subcordate at base, the inner lobes elliptic.

Eastern slope of the Sierra Nevada, 5000 to 10,000 feet. North to Washington, east to the Rocky Mts.

Locs.—Sonora Pass, *Brewer* 1888; Mono Pass, *Bolander* 6356; White Mts., *Purpus* 6424 (flowers yellow = var. *aureum* Stokes); Cottonwood Creek, Inyo Co., *Purpus* 1919; Bear Valley, San Bernardino Mts. acc. *Parish*.

Refs.—*ERIOGONUM MICROTHECUM* Nutt. Jour. Acad. Phila. ser. 2. 1: 162 (1848), type loc. hills east of Walla Walla, *Nuttall*; *Parish*, Zoe, 4: 166 (1893). *E. effusum* Nutt. l. c. 164, type loc. northern Rocky Mts., *Nuttall*. *E. confertiflorum* Benth. in DC. Prodr. 14: 17 (1856), type loc. Shasta River, *Wilkes* Exped.

E. CORYMBOSUM Benth. in DC. Prodr. 14: 17 (1856), type loc. Grand River, *Fremont*. *Watson* (Bot. Cal. 2: 28) and *Coville* (Contrib. U. S. Nat. Herb. 4: 186) cite this species as occurring on the eastern slope of the Sierra Nevada, but all Sierran specimens seen by us are referable to *E. microthecum*.

37. *E. arborescens* Greene. Shrubby, several feet high, the trunk 3 to 4 inches thick; leaves crowded at the ends of the many branchlets, linear or oblong, strongly revolute, white-tomentose beneath, glabrate above, $\frac{1}{2}$ to $1\frac{1}{4}$ inches long; peduncles stout, bearing a large compound cyme, the involucres in capitate clusters; calyx rose-color, densely white-villous at base.

Santa Barbara Islands: Santa Cruz; Anacapa; Santa Rosa.

Ref.—*ERIOGONUM ARBORESCENS* Greene, Bull. Cal. Acad. 1: 11 (1884), type loc. Santa Cruz Island, *Kellogg & Harford*.

38. *E. giganteum* Wats. Freely branching shrub 2 to 8 feet high, bearing its white foliage towards the ends of the tomentose or glabrate branches; trunk with rough bark, 1 to 4 inches in diameter; leaves leathery, ovate, obtuse, 1 to $2\frac{1}{2}$ inches long, white-lanate on both sides or glabrate above, strongly veined beneath, the petioles $\frac{1}{2}$ to 1 inch long; peduncles stout, bearing a dense tri- or di-chotomously branched compound cyme 2 to 12 inches broad; involucres sessile or pedicellate, somewhat crowded on the branchlets, campanulate with very low teeth, almost as if truncate, 2 lines long, densely close woolly outside; calyx 1 line long, densely white-hairy toward the cuneate base, its segments broadly obovate, rounded at apex, the inner narrower; filaments pubescent at base.

Santa Barbara Islands: Santa Catalina; San Clemente; Santa Cruz.

Refs.—*ERIOGONUM GIGANTEUM* Wats. Proc. Am. Acad. 20: 371 (1885), type loc. Santa Catalina Isl., *W. S. Lyon*. Var. *FORMOSUM* K. Brandegee, Erythea, 5: 79 (1897), type loc. San Clemente Isl., *T. S. Brandegee*; leaves oblong-lanceolate.

39. *E. cinereum* Benth. Shrub 2 to 5 feet high, the stems tomentulose; leaves ovate, puberulent above, obtusish, the larger abruptly short-cuneate at base, undulate, thinly gray-tomentose beneath, $\frac{1}{2}$ to $1\frac{1}{4}$ inches long, short-petioled; peduncles elongated, sparingly dichotomous, the heads few and scattered in the forks; involucres tomentulose, $1\frac{1}{2}$ to 2 lines long, with 5 triangular teeth; calyx densely silky outside, its segments narrowly obovate, obtuse, $1\frac{1}{2}$ lines long; filaments glabrous.

Bluffs and foothills along the coast: Santa Barbara to Santa Monica and San Pedro.

Ref.—*ERIOGONUM CINEBEUM* Benth. Bot. Sulph. 45 (1844), type loc. San Pedro.

40. *E. parvifolium* Smith. Shrub 1 to 3 feet high, or woody only at base; branches densely leafy with fasciated leaves; leaves thick, oblong-lanceolate

to ovate or roundish, undulate and irregularly revolute-margined, truncatis or subcordate at base, dark green and glabrate above, white with a dense felt beneath, 2 to 6 lines long, shortly petioled; peduncles short, simple or umbellately 2 or 3-forked, bearing terminal or racemously scattered heads of involucre, the heads few, compact, also sessile in forks when the inflorescence is umbellate; involucre 2 lines long, glabrate outside, densely woolly on inside at throat; calyx white, glabrous, $1\frac{1}{2}$ to 2 lines long, its segments obovate, the outer obtuse, the inner slightly broader and retuse; filaments a little hairy at base.

Sand-dunes and hillsides near the coast; Monterey Bay to Southern California.

Locs.—Santa Cruz, acc. *Anderson*; Pt. Pinos, Monterey, *Jepson*; Carmel Mission, *Jepson*; Little Sur, *Jepson* 2604; Oceanside, *Parish* 4445; Carlsbad, *Alderson*.

Ref.—*ERIOGONUM PARVIFOLIUM* Smith in Rees, Cycl. 13 (1819), the type from California, *Menzies*.

41. *E. fasciculatum* Benth. FLAT-TOP. "WILD BUCKWHEAT." Woody at base, 2 to 3 feet high, with shreddy bark; branches very leafy, ending in a mostly short (1 to 3 inches) peduncle bearing the inflorescence; involucre in capitate clusters or heads; heads terminal on the unequal rays or sessile in the forks of a simple or compound umbel, or the umbel reduced and capitate; rays 1 to 4 inches long; bracts linear; leaves oblong, linear or oblanceolate, revolute margined, 4 to 8 lines long, drawn down to a narrow base, densely white-woolly below, usually green and glabrate above; involucre 2 lines long, with short acute teeth; calyx white, glabrous, $1\frac{1}{4}$ to $1\frac{3}{4}$ lines long, the outer segments elliptic, the inner obovate and narrower, all rounded at apex; filaments glabrous or nearly so.

Abundant on mesas and mountain slopes from Monterey Co. to Southern California. It is generally known as "Wild Buckwheat" and is the third most valued native bee-plant after White Sage and Black Sage. The typical form described above, with glabrous flowers, is confined to the sea-coast from Santa Barbara to San Diego. The two dominant mesa forms are the following varieties.

Var. *foliolosum* Stokes. Peduncles long (4 to 10 inches); leaves more strongly revolute-linear, green but pubescent above, tomentose beneath; calyx slightly hairy outside.—Chaparral slopes, the abundant form: Santa Barbara to San Diego and east to San Bernardino and Temescal.

Var. *polifolium* T. & G. Peduncles long; foliage gray, the leaves commonly less revolute, hoary above, tomentose below; calyx often conspicuously hairy outside, especially towards the base.—Desert slopes of the mountains in the Colorado and Mohave deserts west to Palomar; north to Bakersfield and Inyo Co., east into Nevada.

Refs.—*ERIOGONUM FASCICULATUM* Benth. Trans. Linn. Soc. 17: 411 (1837), types from California, *Menzies*, *Douglas*. *E. aspalathoides* Gand. Bull. Soc. Roy. Bot. Belg. 42: 189 (1905), type loc. Los Angeles. Var. *maritimum* Parish, Muhl. 3: 59 (1907), type loc. Oceanside, *Parish* 4445. Var. *FOLIOLOSUM* Stokes; Abrams, Bull. N. Y. Bot. Gard. 6: 351 (1910). *E. rosmarinifolium* Nutt. Jour. Phila. Acad. ser. 2, 1: 164 (1848), type loc. Santa Barbara, *Nuttall*. Var. *foliolosum* Nutt. l. c. 165, type loc. Santa Barbara, *Nuttall*. Var. *oleifolium* Gand. Bull. Soc. Roy. Bot. Belg. 42: 189 (1905), San Diego. Var. *POLIFOLIUM* T. & G. Proc. Am. Acad. 8: 169 (1870). *E. polifolium* Benth. in DC. Prodr. 14: 12 (1856), based on *Fremont*, Sierra Nevada (probably near Tehachapi), and *Parry*, San Diego.

42. *E. latifolium* Smith. Flowering stems from a densely leafy caudex, stout, tomentulose, naked, $\frac{1}{2}$ to 2 feet high, 2 to 4-forked above, the forks simple or again forked; involucre in capitate clusters, terminal and sessile in the forks, or the whole inflorescence often reduced to a single large head or with one proliferous branch from under the first head; leaves ovate to oblong, obtuse or acute, at base rounded or cordate, rarely cuneate, often

undulate, densely white-woolly or lanate, or glabrate above. 1 to 2½ inches long, the petioles short or long; involucre tomentose, 2 lines long; calyx glabrous, white or light rose-color, 1½ lines long; filaments woolly at base.



Fig. 79. *ERIOGONUM NUDUM* Dougl. *a*, habit, $\times \frac{1}{4}$; *b*, leaf, $\times \frac{1}{2}$; *c*, flower, $\times 8$.

Rocky cliffs or sandy places along the sea-coast from Humboldt Co. to Southern California.

Locs.—Ano Nuevo Point, *Jepson* 4167; San Francisco, *Leila Hibbard*; Bodega Pt., *Eastwood*; Pt. Reyes, *Jepson* 1176; Humboldt Bay, *Tracy* 1205 (the inner calyx segments slightly hairy on back).

Ref.—*ERIOGONUM LATIFOLIUM* Smith in Rees, Cycl. 13 (1819), the type from California, *Menzies*.

43. *E. nudum* Dougl. *TIBINAGUA*. (Fig. 79.) Tall and slender, 1 to 3 feet high, the stems glabrous, peduncle-like, often fistulous, sometimes inflated, branching into a usually large panicle, the leaves all at base on the short woody caudex; leaves broadly ovate or oblong, obtuse, cordate or abruptly

euneate at base, undulate, densely tomentose beneath, glabrate above, 1 to 2 inches long, on slender petioles; involucre 2 or 3 lines long, glabrous or nearly so, 2 to 6 in each cluster; calyx glabrous, at least outside, 1 to $1\frac{1}{2}$ lines long, usually white, sometimes rose-color or yellow; filaments a little hairy at base.

Throughout California, very common on dry hills, valley flats or mountain slopes in the Coast Ranges and Sierra Nevada. Oregon. July-Oct.

Locs.—Shasta Co., *Jones & Alexander*; Willow Creek, Humboldt Co., *Tracy* 3294; Bartletts, Lake Co., *K. Brandegee*; Petaluma, *E. Palmer*; Hackberry Cañon, Caliente, *K. Brandegee*; Tehipite, *Hall & Chandler* 514; Yosemite, *Jepson* 5661; Little Yosemite, *Jepson* 3152; Rancheria Mt., *Jepson* 4610.

Eriogonum nudum is an inconstant species and many specific segregates of it have been published, the diagnoses leaning most heavily on two variable characters, namely the degree of branching of the inflorescence and the degree of hairiness. The acceptance of these specific segregates would, however, require the naming of many forms still unnamed and necessitate a still greater refinement of obviously inconstant characters. We are therefore disposed to arrange the more well-known forms as varieties.

Var. *deductum* Jepson n. comb. Stems many from the base, 5 to 13 inches high, umbellately trichotomous above, glabrous; leaves oval, $\frac{1}{2}$ to $\frac{3}{4}$ inch long, on petioles 3 to 4 times as long.—High Sierra Nevada, 7500 to 9500 feet. Seems no more than a slightly reduced state of the common form of the species prevailing at lower altitudes in the Sierra.

Locs.—Hockett's Mdw., *Culbertson* 4441; Farewell Gap, *Jepson* 1035; Wildflower Lake, Kearsarge Pass, *Jepson* 878; Mt. Tallac, *For.*

Var. *scapigerum* Jepson n. comb. Like var. *deductum* but the inflorescence reduced to single heads terminating the slender scape-like stems.—High mountains about the upper Kern River.

Locs.—Cirque Peak, *Hall & Babcock* 5504; near Whitney Meadows, *Purpus* 1559.

Var. *pubiflorum* Benth. Stems $1\frac{1}{2}$ to 3 feet high, often inflated, glabrous, the branches elongated; involucre 1 to 3 in a place; calyx deep yellow, hairy towards the base.—Desert region: Pahute Peak, *Purpus* 5535; Mt. Pinos, *Hall* 6623 (calyx white); Independence, *Hall & Chandler* 7295; Goose Valley, Modoc Co., *Austin & Bruce*; Yreka, *Butler* 213, 1605; Hamburg, Siskiyou Co., *Jepson* 2954.

Var. *pauciflorum* Wats. Stems often inflated, indefinitely dichotomous, the involucre scattered along the slender branches or occasionally in pairs; calyx white.—Southern California: San Jacinto and San Bernardino mountains.

Var. *oblongifolium* Wats. Stems and involucre whitish tomentulose, the stems about twice di- or tri-chotomous, the branches rather strict; leaves broadly oblong, $\frac{1}{2}$ to $2\frac{1}{2}$ inches long, abruptly contracted to slender petioles $1\frac{1}{2}$ to 3 inches long; calyx white or rarely pale yellow, somewhat pubescent on the inner lobes.—Napa Co. to Humboldt Co. and east to Modoc Co., thence south to Nevada Co., here apparently blending with the ordinary Sierran form.

Var. *sulphureum* Jepson n. comb. Like the preceding but the branches of the inflorescence more spreading; calyx pale yellow or white, a little hairy at base.—Eden Valley, Mendocino Co., to Siskiyou Co.

Var. *auriculatum* J. P. Tracy in herb. Stems $1\frac{1}{2}$ to $2\frac{1}{2}$ feet high, somewhat caudex-like at base, the caudexes set with leaves or old leaf-bases, $\frac{1}{2}$ to 4 inches high, each giving rise to a glabrous glaucous peduncle bearing a dichotomous panicle; peduncles sometimes strongly fistulous; leaves oblong to elliptic, obtuse, truncate or subcordate at base, crenulate-undulate margined, densely white-lanate below, soon glabrescent and deep green above, 1

to 2½ inches long; panicle usually large, the heads large, terminal and lateral, less commonly in the forks.—Central Coast Ranges, dry rocky hills.

Locs.—Berkeley and Oakland hills. This form differs from the Sierra Nevada plant at middle altitudes in its stouter stems, larger and denser heads which are often lateral on the branches of the panicle as well as terminal. It is a peculiarity of the flowers that they tend to persist in age, whereas in Sierra Nevada specimens they quickly fall in drying.

Var. *grande* Jepson n. comb. Tall (3 to 5 feet high) with a woody base; leaves ovate-oblong, the margin undulate-revolute, white-lanate below, 1½ to 3 inches long; involucre 3 lines long; calyx nearly or quite glabrous inside.—Santa Barbara Islands.

Refs.—*ERIOGONUM NUDUM* Dougl.; Benth. Trans. Linn. Soc. 17: 413 (1837), type loc. Multnomah (Willamette Valley), Ore., Douglas. *E. longulum* Greene, Pitt. 5: 70 (1902), type loc. Lake Co. region. *E. oblancoeatulum* Greene, l. c. 71, type loc. Mt. St. Helena. Var. *DEDUCTUM* Jepson. *E. deductum* Greene, Pitt. 5: 71 (1902), type loc. high Sierra Nevada. Var. *SCAPIGERUM* Jepson. *E. scapigerum* Eastw. Proc. Cal. Acad. ser. 3, 2: 286, type loc. Harrison's Pass, Tulare Co., Eastwood. Var. *PUBIFLORUM* Benth. in DC. Prodr. 14: 13 (1856), type collected by Fremont in California, probably in the Mohave Desert. *E. saricolum* Heller, Muhl. 2: 191 (1906), type loc. Bishop, Heller 8298. Var. *PAUCIFLORUM* Wats. Proc. Am. Acad. 12: 264 (1877). Var. *OBLONGIFOLIUM* Wats. Proc. Am. Acad. 12: 264 (1877). *E. affine* Benth. in DC. Prodr. 14: 13 (1856), type loc. Umpqua River, Oregon, Pickering & Brackenridge; calyx glabrous. *E. harfordii* Small, Bull. Torr. Club, 25: 47 (1898), type loc. Long Valley, Mendocino Co., Kellogg & Harford, is very similar to var. oblongifolium. *E. capitatum* Heller, Muhl. 2: 27 (1905), type loc. Nevada City, Heller 8099. Var. *SULPHUREUM* Jepson. *E. sulphureum* Greene, Pitt. 5: 70 (1902), type loc. Yreka, Greene 923; very whitish tomentose and the branches of the inflorescence more divergent than usual. Var. *AURICULATUM* Tracy. *E. auriculatum* Benth. Trans. Linn. Soc. 17: 412 (1837), type from California, Douglas; "petiolis basi saepius auriculato-dilatatis" says Benthams, but in DC. Prodr. 14: 13 he says "petiolis longis basi saepius auriculato-dentatis", neither of which phrases apply well to our plants referred to this variety, which should be described as *petiolis sublongis basi subamplexicaulibus*. Var. *GRANDE* Jepson. *E. grande* Greene, Pitt. 1: 38 (1887), type loc. Santa Cruz Isl. *E. rubescens* Greene, l. c. 39, type loc. San Miguel Isl.; flowers rose-red.

44. *E. elatum* Dougl. Stems rigid and rush-like, rarely naked, 1 to 2½ feet high, sometimes inflated, bearing a trichotomous panicle, glabrous and glaucous; leaves erect, ovate to ovate-lanceolate, 1 to 3 (or 5) inches long, on petioles mostly as long; involucre in terminal clusters of 2 to 4, or solitary in the forks, either sessile or shortly pedunculate, hairy-pubescent, 2¼ lines long, 5-toothed, the teeth scarious-margined; calyx white, 1 to 1½ lines long, its segments obovate, rounded at apex, with broad hairy-pubescent midvein.

Mountains, northern California to Washington and Nevada.

Locs.—Mono Lake, Congdon; Eagle Lake, Lassen Co., Baker & Nutting; Modoc Co., R. M. Austin; Independence Creek, Siskiyou Co., Butler 202.

Var. *villosum* Jepson n. var. Stems villous-pubescent.—(Caules villosopubescentes.)—Dry hills, northern California: Yreka, Butler 1606. Ranging east into Modoc Co.

Var. *incurvum* Jepson n. var. Pubescence of preceding; branches or rays of ternately trichotomous panicle curving, fragile at the joints.—(Pubescentia praecedentis; radii paniculae curvati, nodi fragiles.)—Shasta Sprs., Jepson.

Ref.—*ERIOGONUM ELATUM* Dougl.; Benth. Trans. Linn. Soc. 17: 413 (1837), type loc. Columbia River, Douglas.

45. *E. indictum* Jepson n. sp. Stems 1 to 2 feet high, several from the base, glabrous, glaucous, the lower internodes inflated like a slender trumpet; leaves ovate or deltoid-ovate, truncatish at base, white-woolly below, whitish-arachnoid above, persistent on both faces. 1½ to 2½ inches long, the petioles as long and with a broad clasping base; involucre externally glabrous, tubular but a little widened upward, 2 lines long, solitary and racemose along the slender branches of the dichotomous panicle; calyx yellowish, glabrous.—(Caules 1-2 pedales, glabri, glauci, internodiis inferioribus inflatis; inflorescentia dichotomo-panicula, ramis tenuibus et involucri solitariis racemosis; involucrea subtubulosa, glabra, glauca, lin. 2 longa.)

Dry hills, San Carlos Range. Nearly related to *E. nudum*.

Locs.—Rancho Cantua, *S. C. Lillis*, type; San Carlos Creek, *Jepson* 2722.

46. *E. kennedyi* Porter. Stems scape-like, wiry, 3 to 8 inches high, arising from a very dense leafy cushion; leaves obovate or oblong, revolute, white-woolly, $1\frac{1}{2}$ to 5 lines long; involucre tomentulose or glabrate, turbinate-campanulate, nerved and rather strongly angled, deeply triangular-toothed, $1\frac{1}{2}$ to 2 lines long, clustered in a terminal head; calyx white or pink, glabrous, 1 to $1\frac{1}{2}$ lines long, segments oblong-obovate; ovary scabrous.

Desert slopes or arid plateaus, north and south of the Mohave Desert.

Locs.—Mt. Pinos, *Hall* 6445; San Bernardino Mts. (where often very much reduced), *Abrams* 2890; foothills west of Bishop, *Heller* 8317.

Refs.—*ERIOGONUM KENNEDYI* Porter; *Wats. Proc. Am. Acad.* 12: 263 (1877), *Sierra Nevada in Kern Co.*, *W. L. Kennedy*.

E. purpusi Brandegee, *Bot. Gaz.* 27: 457 (1899), type loc. Argus Mts., *Purpus* 5484. Leaves obovate, 2 to 3 lines long; peduncles filiform; calyx-segments elliptic, abruptly dilated from the base. The sinuses of the involucre usually split down rather freely in the type. Also collected at Independence by *Hall & Chandler* 7297. It seems to be conspecific with *E. kennedyi*. *E. gracilipes* Wats. *Proc. Am. Acad.* 24: 85 (1889), type loc. White Mts., Mono Co., *Shockley*, with glandular-puberulent peduncles seems to be very similar to *E. kennedyi* also.

47. *E. ochrocephalum* Wats. Stems scape-like, 2 to 6 inches high, erect from a caespitose leafy base; leaves silvery-tomentose, oblanceolate to ovate, $\frac{3}{4}$ to $1\frac{1}{4}$ inches long, narrowed to a petiole half to as long; involucre in a capitate cluster, turbinate-bellshaped, bladdery in age. $1\frac{1}{2}$ to $2\frac{1}{2}$ lines long, the 6 to 8 short lobes erect; calyx yellow, glabrous. 1 to $1\frac{1}{4}$ lines long, the segments elliptic, the inner narrower, all obtuse; filaments obscurely puberulous at base.

Northwestern Nevada and eastern Oregon.

Var. *agnellum* Jepson n. var. Dwarfier form, 2 to 4 inches high, the upper portion of peduncles and heads a little glandular; leaves ovate or narrowly

obovate, 2 to 4 lines long, petioled.—(*Nanior. pedunculis uncialis* 2-4 ad summis capitave subglandulosis, foliis ovatis vel obovatis angustatis, lin. 2-4 longis, petiolatis.) — Northern Sierra Nevada: Placer Co., *Sonne*, type, to Modoc Co. (Willow Creek Valley, *R. M. Austin*).

Ref.—*ERIOGONUM OCHROCEPHALUM* Wats, *Bot. Cal.* 2: 480 (1880), type loc. n. w. Nev., *Lemmon*.

48. *E. ovalifolium* Nutt. (Fig. 80a.) Sub-alpine dwarf, the scape-like stems slender, tomentulose, $\frac{1}{2}$ to 3 inches high, rising from a dense leafy cushion; leaves round-ovate to obovate, 1 to 4 lines

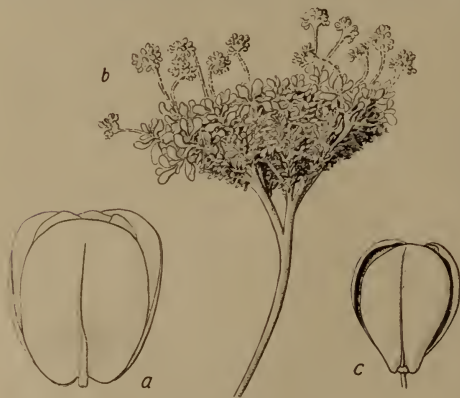


Fig. 80. a, *ERIOGONUM OVALIFOLIUM* Nutt.; flower, x 10. b, var. *NIVALE* Jones; habit, x 1; c, flower, x 10.

long, contracted to a usually short petiole; involucre turbinate, woolly, several crowded together in a very close head with 3 or 4 short bracts; calyx white,

with green midribs, often fading pinkish, glabrous, 1 to $1\frac{1}{2}$ lines long; outer calyx segments elliptical, subcordate at base, their margins quite free and distinct to base, the inner broadly spatulate; filaments hairy at very base.

Granite peaks and ridges, Sierra Nevada, 9000 to 12,000 feet. North to British Columbia and east to the Rocky Mts.

Locs.—Kearsarge Pass, *Jepson* 899; Mono Pass, *Jepson* 4465; Lambert Dome, *Jepson* 3248; Lake Eleanor, *H. W. Turner*; Castle Peak, Nevada Co., *Heller* 7081; Snow Mt., Lake Co., *K. Brandegee*.

Var. *vineum* *Jepson* n. comb. Involucres vase-shaped, constricted near the top; calyx wine-red, $2\frac{1}{2}$ to 3 lines long, its segments unequal.—High montane, California to Washington. Little known to us.

Var. *nivale* *Jones*. (Fig. 80b, c.) Head small and compact, appearing like a single involucre; flowers red; outer calyx-segments obovate; filaments hairy or glabrous.—Southern Sierra Nevada.

Locs.—Tower Peak, *Jepson* 4548; Mt. Dana, *Chesnut & Drew*; Mt. Whitney, *Jepson* 1087, *Hall & Babcock* 5530; Army Pass, *Jepson* 5064; Olancha Peak, *Purpus*.

Refs.—*ERIOGONUM OVALIFOLIUM* Nutt. Jour. Acad. Phila. 7: 50, pl. 8, f. 1 (1834), type loc. headwaters of the Missouri, *Wyeth*. Var. *VINEUM* *Jepson*. *E. vineum* Small, Bull. Torr. Club, 25: 45 (1898), type locs. Rose Mine, San Bernardino Mts., *Parish* 3170, and Powder River Mts., Ore., *Cusick*. Var. *NIVALE* *Jones*, Contrib. 11: 8 (1903). *E. nivale* Canby, Contrib. U. S. Nat. Herb. 4: 187 (1893). In material of *E. nivale* from type locality (Siberian Pass, *Hall & Babcock* 5481) the involucres appear, as said in original description, to be solitary, but examination reveals 3 or 4 involucres so closely crowded in a deeply 3 or 4-parted primary involucre or whorl of bracts as to appear like a single involucre. This form is doubtfully of even varietal value.

49. *E. proliferum* T. & G. Stems erect, naked, scape-like, 4 to 7 inches high, bearing an umbellate inflorescence and arising from a compactly branched caudex with very short leafy branches; herbage tomentulose, the leaves densely white-woolly; leaves ovate, mostly obtuse, 4 to 12 lines long, on petioles as long or longer; umbels with 3 rays from beneath the sessile central involucre; rays $\frac{1}{2}$ to 2 inches long, somewhat unequal, bearing a cluster of 2 or 3 involucres, or one or more of the rays again shortly 3-radiate; involucre 5-toothed, the teeth large, almost hooded; calyx white, 2 to $2\frac{1}{2}$ lines broad, the outer segments roundish quadrate or elliptic (nearly as broad at base and apex as at middle), attached by the lower $\frac{1}{3}$ of the midnerve, the sides free and overlapping; inner segments obovate, narrowed to a claw-like base.

Northern Sierra Nevada to Siskiyou Co.; north to British Columbia and east to the Rocky Mts.

Locs.—Sierra Valley, *Lemmon*; Yreka, *Butler* 970, 1417; Little Shasta Valley, *Hall & Babcock* 4099; Scott Valley, *Jepson* 2196; Marble Mt. region, *Butler* 211.

Refs.—*ERIOGONUM PROLIFERUM* T. & G. Proc. Am. Acad. 8: 164 (1870), type loc. Columbia River region. *E. greenii* Gray, Proc. Am. Acad. 12: 83 (1876), type loc. Yreka, *Greene*. *E. dichotomum* Wats. Bot. Cal. 2: 26 (1880), not Dougl. *E. ovalifolium* var. *proliferum* Wats. Proc. Am. Acad. 12: 263 (1877).

E. ANSERINUM *Greene*, Pitt. 4: 320 (1901), type loc. Goose Lake, Modoc Co., *R. M. Austin*. Inflorescence narrow and fastigate; calyx greenish yellow (ex char.).

III.—SUBGENUS *Eueriogonum*.

Involucres turbinate, 4 to 8-toothed or -lobed, either solitary or borne in umbels, the umbels sometimes congested in heads; bracts foliaceous; calyx stipe-like at base, often accrescent, filaments mostly hairy or pubescent at base; flowering stems (peduncles) scape-like; perennials; mountains from middle altitudes to alpine summits.

50. *E. caespitosum* Nutt. Dwarf, matted, the scape-like peduncles slender, naked, 2 to 4 inches high, bearing a single involucre; leaves white-tomentose, oval to oblong-spatulate, 2 to 3 lines long, the petioles $\frac{1}{3}$ to as long; involucral lobes linear, as long or longer than the turbinate tube; calyx yellow or fading reddish, 1 to $1\frac{1}{2}$ lines long, in age nearly twice as long, hairy on the mostly stipe-like base; filaments pilose; ovary glabrous.

Mountain slopes and dry plateaus east of the Sierra Nevada. Nevada, Oregon, east to the Rocky Mts.

Locs.—Lake City, Modoc Co., *Bruce*; White Mts., *Purpus* 5798.

Ref.—*ERIOGONUM CAESPITOSUM* Nutt. Jour. Acad. Phila. 7: 50, pl. 8, f. 2 (1834), type loc. headwaters of the Columbia, *Nuttall*.

51. *E. douglasii* Benth. Matted white-woolly dwarf similar to the preceding, the scape-like peduncles with a whorl of 5 or 6 oblanceolate bracts at the middle; involueral lobes linear, longer than the tube, reflexed; calyx yellow, hairy at base and along the midrib of the segments, stipe-like at base, 2 to 3 lines long, its segments obovate, obtuse, the inner exceeding the outer in age; lower half of filaments pilose; ovary hairy towards apex.

Northern Sierra Nevada. Nevada to Washington.

Locs.—Donner, *Kellogg* in 1870; Sierra Valley, *Lemmon*; Susanville, *Brandegee*.

Refs.—*ERIOGONUM DOUGLASHII* Benth. in DC. Prodr. 14: 9 (1856), type loc. Blue Mts., Ore., *Gairdner*, *Douglas*. *E. caespitosum* var. *douglasii* Jones, Contrib. 11: 7 (1903), the reduction perhaps well taken.

52. *E. sphaerocephalum* Dougl. Peduncles 3 to 6 inches high, bearing a solitary involucre and with a whorl of leafy bracts at their middle, or the whorl subtending a 2 to 4-rayed umbel, the rays also bearing a central whorl of bracts; base much-branched, with many short woody leafy branchlets; leaves oblong to broadly oblanceolate, acute, narrowed to a short petiole, 5 to 10 lines long, white-woolly below, soft pubescent above, the margins often revolute; involucre almost bowl-shaped, 3 to 4 lines long, its (7 or 8) oblong lobes as long or longer than the tube; flowers numerous in an involucre, forming a globose cluster; calyx whitish, very villous inside and out, especially towards the base, stipe-like at base, 4 lines long, the segments obovate or elliptic, obtuse; filaments hairy on lower half; ovary densely villous except at base.

Lassen Co. to Shasta Co. and north to Washington. May-June.

Locs.—Susanville, *Brandegee*; Egg Lake, *Baker & Nutting*; Willow Creek Valley, Modoc Co., *Austin*; Pit River Valley, *Hall & Babcock* 4253; Yreka, *Butler* 721, 1371, 1428.

Refs.—*ERIOGONUM SPHAEROCEPHALUM* Dougl.; Benth. Trans. Linn. Soc. 17: 407 (1837), type loc. Columbia River, *Douglas*.

53. *E. tripodium* Greene. Habit similar to *E. sphaerocephalum* but more slender and taller (10 to 14 inches high); umbel 3-rayed, the rays 3 to 5 inches long, bearing a whorl of bracts at the middle or sometimes 2-forked and again bracteate; calyx yellow, densely hairy, 2 to 3 lines long, the stipe-like base very short; filaments hairy below; ovary very strongly angled, hairy at apex.

Indian Valley, Lake Co., *Cleveland*; Benton Mills Road, Mariposa Co., *Congdon*.

Ref.—*ERIOGONUM TRIPODUM* Greene, Pitt. 1: 39 (1887), type loc. Hough's Sprs., Lake Co., K. Curran. *E. sphaerocephalum* var. *brevifolium* Stokes; Jones, Contrib. 11: 6 (1903).

54. *E. siskiyouensis* Small. Like *E. umbellatum* but the involucre solitary on an erect peduncle 4 to 10 inches high, with a whorl of bracts at middle (that is, the umbel reduced to one ray which is as long or longer than the peduncle); bracts foliaceous, ovate, petioled, 2 to 6 lines long, the basal leaves of the same shape but usually larger.

High montane: Scott Mts., Siskiyou Co.; Calaveras Big Trees, *Brandegee*; Lake Merced, *Jepson* 3183. Hardly more than a variant of *E. umbellatum* and yet unlike the dwarf monocephalous states of that species.

Ref.—*ERIOGONUM SISKIYOUENSIS* Small, Bull. Torr. Club, 25: 44 (1898), type loc. Scott Mts., *Greene*.

55. *E. umbellatum* Torr. SULPHUR-FLOWER. (Fig. 81.) Peduncles erect or ascending from a branching woody base, naked, 3 to 5 inches high, tomentulose or glabrate; leaves ovate, glabrate above, white-woolly beneath, 3 to

12 lines long, on petioles $\frac{1}{4}$ to $\frac{1}{2}$ as long; umbels simple, subtended by a whorl of linear to obovate bracts, its rays 3 to 9 (rarely reduced to 1), 5 lines to $1\frac{1}{4}$ inches (or 3) long, these and the bracts soft-pubescent; involucre 8-lobed, the lobes reflexed, nearly as long as the turbinate tube, the tube and throat crowded with the floccose-woolly bractlets; flowers sulphur-yellow; calyx glabrous, gradually narrowed into the long stipe-like base, 2 to 3, or in age 3 to 4 lines long; filaments pilose on lower half.



Fig. 81. *ERIOGONUM UMBELLATUM* Torr. a, umbel, past anthesis, x 1; b, flower, x 8.

Higher Sierra Nevada and Coast Ranges, 4000 to 9000 feet; north to Washington and east to the Rocky Mts.

Locs.—Shasta River, *Butler* 968; Humbug Mt., *Butler* 215; near Mt. Shasta, *Jepson*; King Creek, Lassen Co., *Jepson* 4115; Portola, K. *Brandegee*; Bear Valley, Nevada Co., *Jepson*; Lake Merced, Yosemite Park, *Jepson* 3183; Glacier Pt., *Jepson* 5643; near Mt. Whitney, *Jepson* 936; Farewell Gap, *Jepson* 997; Trinity Summit, *Jepson* 2119; South Yollo Bolly, *Jepson*.

Var. *stellatum* Jones. Rays simple and bearing a whorl of bracts at their middle or usually forked and the secondary rays similarly bracteate.—San Bernardino Mts.; Sierra Nevada; Siskiyou Co.; north to Washington.

Var. *bahiaeforme* Jepson n. comb. Inflorescence freely and irregularly branched.—Tehachapi region.

Var. *monocephalum* T. & G. Dwarf mountain form with the umbel reduced to a single ray, that is, the peduncle naked or bracteate and bearing a solitary involucre.—Range of the species but far less common. Snow Mt., K. *Brandegee*; South Yollo Bolly, *Jepson*.

Refs.—*ERIOGONUM UMBELLATUM* Torr. Ann. N. Y. Lyc. Nat. Hist. 2: 241 (1828), type loc. Rocky Mts.; Benth. Trans. Linn. Soc. 17: 410, t. 18, fig. 2 (1837); Sitgreaves Exped. pl. 12 (1853). *E. speciosum* Drew, Bull. Torr. Club, 16: 152 (1889), type loc. S. Fork Trinity River, Hy-am-pum Valley, *Chesnut & Drew*. *E. dumosum* Greene, Pitt. 3: 199 (1897), type loc. American Valley, Plumas Co., R. M. *Austin*, said to be a shrub 5 or 6 feet high. *E. trichotomum* Small, Bull. Torr. Club, 25: 43 (1898), type loc. Mt. Hamilton, *Greene*. *E. reclinatum* Greene, Pitt. 5: 67 (1902), Sierra Nevada and adjacent Nev. (the peduncles ascending). *E. modocense* Greene, l. c. 68, type loc. Davis Creek, Modoc Co. *E. smallianum* Heller, Bull. S. Cal. Acad. 2: 68 (1903), type loc. Mt. Sanhedrin, *Heller* 5996. Var. *STELLATUM* Jones, Contrib. 11: 5 (1903). *E. stellatum* Benth. Trans. Linn. Soc. 17: 409 (1837), type loc. interior of N. W. America, *Douglas*. *E. croceum* Small, Bull. Torr. Club, 25: 43 (1898), based on Idaho and Oregon spms. Var. *BAHIAEFORME* Jepson. *E. stellatum* var. *bahiaeforme* Wats. Bot. Cal. 2: 20 (1880). *E. ovatum* Greene, Pitt. 5: 69 (1902), type loc. Silver Lake, Lassen Co., *Baker & Nutting*. Var. *MONOCEPHALUM* T. & G. Proc. Am. Acad. 8: 160 (1870), type loc. western U. S.

56. *E. torreyanum* Gray. Habit of *E. umbellatum* but stems and leaves glabrous; outer rays of the umbel with a whorl of bracts midway; leaves obovate, thickish, about 1 inch long, narrowed below to a petiole as long; involucre lobes sparingly pubescent; calyx yellow, $\frac{1}{2}$ to 5 lines long; filaments hairy below.

Northern Sierra Nevada, 5000 to 7000 feet. This seems to be only a glabrous form of *E. umbellatum*.

Locs.—Squaw Creek, Placer Co., *Sonne*; Donner, *Kellogg*; Webber Lake, *Lemmon*.

Refs.—*ERIOGONUM TORREYANUM* Gray; T. & G. Proc. Am. Acad. 8: 158 (1870), type loc. Donner's Pass, *Torrey* 443. *E. umbellatum* var. *torreyanum* Jones, Contrib. 11: 5 (1903).

57. *E. compositum* Dougl. Scape-like stems stout, 6 to 16 inches high from a simple short caudex, glabrate; leaves oblong-ovate or deltoid-ovate, cordate at base, $1\frac{1}{2}$ to 2 inches long, with a close white felt beneath, green above or woolly-flocculent; petioles long, mostly 1 to $2\frac{1}{2}$ times length of blade; bracts linear or oblanceolate; umbel 6 to 10-rayed, the rays sometimes with a blackish band at middle, $\frac{1}{2}$ to 2 inches long, each bearing a capitate cluster of 1 to 5 involucres or a several-rayed umbellet; involucre broadly turbinate, woolly, 8-toothed, the teeth short, acute; calyx cream-color or yellow, glabrous, contracted to a stipe-like base, 2 to 4 lines long; segments elliptic, the inner becoming $\frac{1}{3}$ longer in age; filaments short hairy at base.

North Coast Ranges. Far northward to Washington.

Locs.—Napa Range (near Calistoga) and Snow Mt. (Lake Co.), *K. Brandege*; Long Valley, Mendocino Co., *Bolander* 6567; w. Siskiyou, *Jepson* 2095; Castle Peak, n. e. Mendocino Co., *Jepson*; Siskiyou Co., *Butler* 201 (Independence Creek) and 720 (Klamath River). June-Aug.

Ref.—*ERIOGONUM COMPOSITUM* Dougl.; Benth. Bot. Reg. t. 1774 (1836), type loc. Columbia River, *Douglas*.

58. *E. lobbii* T. & G. Peduncles lying along the ground, 2 to 7 inches long, borne on a densely leafy stout caudex; caudex crowded below with old leaf-bases and crowned with a tuft of silvery white leaves; herbage densely white-woolly; leaves roundish, oval or ovate, $\frac{1}{2}$ to $\frac{3}{4}$ or $1\frac{1}{4}$ inches long, narrowed to rather broad petioles $\frac{1}{2}$ to as long; umbels simple, bracteate, ascending from the tips of the peduncles; rays 3 to 6, $\frac{1}{2}$ to $1\frac{1}{2}$ inches long (or reduced and then the umbels capitate), usually with a whorl of bracts at middle; involucres broadly campanulate, 3 to 5 lines long; calyx white, fading pinkish, narrowed at base but not stipe-like, 3 to 4 lines long; filaments pilose on lower half.

Gravelly drifts and glaciated granite slopes and ridges, Sierra Nevada (Yosemite Park to Nevada Co.) and inner North Coast Range. 7000 to 9500 feet. Western Nevada near Lake Tahoe.

Locs.—Mt. Conness, *Hutchings*; Lambert Dome, *Jepson* 3249; Rancheria Mt., *Jepson* 4589; Macomb Ridge, Yosemite Park, *Jepson* 8572; Bierstadt Peak, *Davy* 3226; Donner Pass, *Heller* 7011; high peaks near Sierra Valley, *Lemmon*; Placer Co., *Carpenter*; South Yollo Bolly, *Jepson*; mts. north of Clear Lake, *Mackie*.

Ref.—*ERIOGONUM LOBBII* T. & G. Proc. Am. Acad. 8: 162 (1870), based on *Lobb* 190 (probably northern Sierra Nevada), *Torrey* (mts. near Donner Pass), and *Stretch* (near Virginia City, Nev.).

59. *E. pyrolaefolium* Hook. Peduncles scape-like, glabrous, 2 to $3\frac{1}{2}$ inches high, arising from a densely leafy caudex; leaves roundish or oval, thick, glabrous, 4 to 12 lines long, abruptly petioled, the petioles villous; umbels small, bearing 1 to 3 involucres on short (1 or 2 lines long) rays or quite capitate; bracts 2, linear or spatulate, elongated; calyx red, not attenuate at base, $1\frac{1}{2}$ to 2 lines long, somewhat glandular inside, hairy at base outside and on midribs half-way up segments; filaments glabrous; upper part of ovary densely hairy.

High northern peaks: Mt. Lassen; Mt. Shasta. North to Mt. Rainier.

Ref.—*ERIOGONUM PYROLAEFOLIUM* Hook. Jour. Bot. & Kew Misc. 5: 395, pl. 10 (1853), type loc. Mt. Shasta, *Jeffrey*.

60. **E. latens** Jepson n. sp. Peduncles naked, 8 to 12 inches high from the short leafy branches of a woody caudex; leaves roundish, or somewhat deltoid-ovate, acutish, short pilose, 7 to 12 lines long, abruptly or cuneately narrowed at base to a margined petiole half to as long as the blade; involucre congested in a terminal head, membranous, campanulate, 3 to 4 lines long, with short broad sparsely hairy lobes; calyx white, its base appressed hairy, the inner segments narrower than the outer; lower third of filaments pubescent.—(Caulis brevissimus caespitosus ramosus, pedunculo nudo 8-12 pollicario; folia lin. 7-12 longa approximata orbiculata vel delto-ovata acutiuscula utrinque breve pilosa ad basin in petiolum marginatum abrupte cuneateve angustatum; involucre ad apicem pedunculi capitata membranacea campanulata lin. 3-4 longa, lobis brevibus latisque; calyx albus extus basi hirsuto-pressus, segmentis interioribus quam exterioribus angustioribus.)

Desert slopes in Inyo Co.: Timosea Peak, *Jepson* 5082, 6500 ft. alt.

61. **E. ursinum** Wats. Peduncles scape-like from a branching woody leafy crown or mat, 4 to 12 inches high, these and the umbels villous-tomentulose; leaves ovate, mostly acute, cordate at base, varying to cuneate, white-tomentose beneath, glabrate and greener above, 4 to 8 lines long, the petiole half to as long; umbel compound, sometimes simple, 3 to 10-rayed or reduced to a head-like cluster; bracts obovate to subfiliform, subtending the umbel and secondary umbels, usually also with a whorl at or near the middle of the rays or secondary rays; involucre campanulate-funneliform, large (3 to 3½ lines high), thin, hairy-pubescent outside, shortly and sharply toothed; calyx yellow or white, glabrous, abruptly campanulate above the stipe-like base, 2 to 3 lines long; filaments copiously woolly, the wool filling the base of the calyx.

High montane, northern Sierra Nevada and North Coast Ranges, 5000 to 8000 feet.

Locs.—Near Summit Station, *Sonne*; Sierra Co., *Eva Kennedy*; Cisco, *Harriet Walker*; Indian and American valleys, *Lemmon*; Mt. Lassen, *Jepson* 4103; Morgan, *Hall & Babcock* 4405; Snow Mt., Lake Co., *Brandegee*.

Ref.—*ERIOGONUM URSINUM* Wats. Proc. Am. Acad. 10: 347 (1875), type loc. Plumas Co. (Long and Bear valleys), *Mrs. M. E. P. Ames, Lemmon*.

62. **E. incanum** T. & G. Peduncles stout, tomentulose, 1 to 3½ inches high, arising from a matted densely leafy crown; leaves white-tomentose, oblong to ovate or obovate, the edges often disposed to be revolute, 3 to 6 lines long, mostly short-petioled; umbels with 4 or 5 rays 2 to 6 lines long or reduced to a small dense head; bracts few, linear; calyx yellow, often red, glabrous, 1 to 2 lines long, narrowed to a short stipe-like base; filaments sparingly hairy at base.

Gravelly slopes and peaks, high Sierra Nevada, 7000 to 12,000 feet.

Locs.—Farewell Gap, *Purpus* 1572; Mt. Whitney, *Jepson* 1076; Bullfrog Lake, *Jepson* 844; Mt. Goddard, *Hall & Chandler* 696; El Capitan, *Jepson* 4364, 4365; Clouds Rest, *Drew*; Mt. Lyell, *Hall & Babcock* 3594, *Jepson* 3327, 3328; Maconb Ridge, *Jepson* 4563, 4564; Tower Peak, *Jepson* 4547; Mt. Ralston, *Hall & Chandler* 4669.

Refs.—*ERIOGONUM INCANUM* T. & G. Proc. Am. Acad. 8: 161 (1870), based on Sierra Nevada specimens, *Brewer* (upper Tuolumne River), *Torrey, Bolander*. *E. rosulatum* Small, Bull. Torr. Club, 25: 46 (1898), type loc. Mineral King, *Coville & Funston* 1549, "filaments glabrous."

63. **E. marifolium** T. & G. Peduncles scape-like, slender, 3 to 12 inches high, arising from a loosely branched leafy base; leaves oval or ovate, white-woolly or commonly glabrate above, 3 to 8 lines long, the petioles mostly as long or longer; umbels with 3 to 6 rays ½ to 2½ inches long, the central involucre sessile, or the umbel sometimes reduced to a small head; flowers often more or less dioecious; yellowish (reddish in age), glabrous, 1 to 1½ lines long.

Higher Sierra Nevada. Perhaps only a variety of the preceding; differs only in its looser growth and larger umbels.

Locs.—Tilden Cañon, Yosemite Park, *Jepson* 4543; Silver Lake, *Hansen* 1261; Summit, Nevada Co., *Jepson*; Donner Pass, *Heller* 7014; Medicine Lake Mts., Siskiyou Co., *M. S. Baker*; Mt. Shasta, *Jepson*.

Refs.—*ERIOGONUM MARIFOLIUM* T. & G. *Proc. Am. Acad.* 8: 161 (1870), based on *Lobb* 192 (probably northern Sierra Nevada), *Brewer* (Mt. Shasta), and *Torrey* (Donner Pass). *E. polypodum* Small, *Bull. Torr. Club*, 25: 46 (1898), type loc. Long Meadow, Tulare Co., *Palmer* 204, filaments glabrous; *Merriam*, *N. Am. Fauna*, 16: 143 (1899).

64. *E. kelloggii* Gray. Peduncles rising from a loose mat, scape-like, slender, 2 to 4 inches high, naked save for whorl of 3 leaf-like bracts at the middle; mat consisting of branching stolon-like woody stems with the leaves in rosettes on the ends of short branchlets; herbage tomentulose throughout or the leaves glabrate above; leaves oblanceolate or narrowly obovate, narrowed to a short petiole, 2 to 5 lines long; involucre solitary, turbinate, 2 to 2½ lines long, with erect teeth; calyx whitish or pinkish, glabrous, stipe-like at base, 3 to 4½ lines long, its segments obovate, rounded at apex; filaments pilose below middle.

Red Mt., Mendocino Co., *Eastwood*, not otherwise known. Remarkably similar in all details of habit to the monocephalous forms of *E. umbellatum*.

Refs.—*ERIOGONUM KELLOGGII* Gray, *Proc. Am. Acad.* 8: 293 (1870), type loc. Red Mt., *Kellogg*. *E. caespitosum* var. *kelloggii* Jones, *Contrib.* 11: 7 (1903).

65. *E. alpinum* Engelm. White-lanate dwarf, 1½ inches high, the scape-like stems with a whorl of bracts at the middle and ending in a single involucre; leaves roundish, 5 to 7 lines broad; involucre turbinate, 3 lines long, with minute teeth; calyx yellow, glabrous, 1½ to 2 lines long, the stipe-like base short, the segments obovate, obtuse; filaments slightly pubescent at base.

Mt. Eddy, Siskiyou Co., 8700 feet, *Copland*.

Refs.—*ERIOGONUM ALPINUM* Engelm. *Bot. Gaz.* 7: 6 (1882), type loc. Scott Mts., *Geo. Engelmann*. *E. copelandi* Greene in hb. *E. alpinum* and *E. copelandi* are "in my opinion undoubtedly conspecific. The only difference is that the Engelman specimen has slightly larger leaves but the inflorescence characters are identical."—*J. M. Greenman*, *Mo. Bot. Gard.* in litt.

CHENOPODIACEAE. SALTBUSH FAMILY.

Herbs or shrubs, mostly salt-loving, very often succulent or scurfy, with alternate or rarely opposite leaves, or leafless. Flowers small (1 or 2 lines long), perfect or unisexual with an herbaceous calyx of 5 or fewer sepals, or in the pistillate flower the calyx sometimes absent. Stamens as many as the sepals and opposite them, or fewer, distinct or slightly united at base. Ovary superior, 1-celled, containing a single ovule, becoming in fruit an achene or utricle. Styles or stigmas 2 or 3. Embryo curved; endosperm copious or sometimes wanting. Nitrophila has a scarious calyx and stamens not distinct.—About 75 genera and 550 species, mostly of alkaline deserts or steppes, and occurring all over the earth.

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Embryo annular or curved, embracing or surrounding the central endosperm, or folded and the endosperm lacking.

Stems with foliaceous leaves.

Leaves opposite, united at base.....1. NITROPHILA.

- Leaves alternate, sometimes the lowest opposite, but never united at base.
 Calyx not horizontally winged, leaves plane (except no. 9).
 Flowers perfect, all of one kind.
 Calyx 3 to 5-parted or -toothed.
 Stamen 1; flowers axillary and solitary.....2. APHANISMA.
 Stamens 5 (or 4); flowers in clusters.
 Calyx with a fleshy disk at base, the ovary partly sunk in it... 3. BETA.
 Calyx without disk.
 Calyx 5 (or 4)-parted, herbaceous or fleshy in fruit..... 4. CHENOPODIUM.
 Calyx saccate, 3 to 5-toothed, dry in fruit...5. ROUBIEVA.
 Calyx of 1 sepal; stamen 1.....6. MONOLEPIS.
 Flowers unisexual, of 2 kinds, the staminate with calyx, the pistillate without calyx and enclosed by 2 appressed bracts.
 Fruits not hairy; leaves not revolute.
 Bracts distinct or more or less united, the margins never wholly united, at least partly free, the sides smooth or muricate... 7. ATRIPLEX.
 Bracts wholly united into an orbicular strongly flattened sac with a pin-hole orifice at apex.....8. GRAYIA.
 Fruits densely white-hairy; leaves linear, revolute.....9. EUROTIA.
 Calyx in fruit surrounded by a 5-lobed wing.....10. KOCHIA.
 Stems with the leaves reduced to mere scales; flowers perfect; stems fleshy, jointed.
 Shrubs; scales alternate.....11. SPIROSTACHYS.
 Herbs; scales opposite.....12. SALICORNIA.
 Embryo spirally coiled, the endosperm lateral or none.
 Leaves more or less fleshy, soft.
 Flowers unisexual, the staminate in a catkin-like spike, the pistillate axillary..... 13. SARCOCATUS.
 Flowers perfect and pistillate, in axillary clusters.....14. SUAEDA.
 Leaves dry, rigid or spiny; flowers perfect.....15. SALSOLA.

1. NITROPHILA Wats.

A low perennial glabrous herb with fleshy opposite amplexicaul leaves and axillary perfect flowers. Sepals 5 (rarely 6 or 7), chartaceous, imbricated, concave and carinate. Stamens 5, united at base into a narrow yellowish disk. Style longer than the subglobose ovary; stigmas 2. Achene beaked by the persistent style, included within the connivent sepals.—One species. (Greek nitron, carbonate of soda, and philos, fond of, these plants loving alkaline soils.)

1. *N. occidentalis* Wats. Stems decumbent, oppositely branching, 4 to 14 inches long, from a deep-seated thick taproot; leaves linear, sessile, $\frac{1}{2}$ to 1 inch long, the floral mostly 3 to 6 lines long, triangular in cross-section, mucronate; flowers solitary in the axils and bibracteate, or often 2 or 3 with the central one frequently bractless and the lateral shortly pedicelled; sepals pinkish or whitish.

Moist alkaline soils, often on the black alkali: Sacramento Valley south through the San Joaquin Valley to Southern and Lower California; desert side of the Sierra Nevada. Nevada; Oregon.

Locs.—Shasta Valley, *Butler* 1849; Solano Co., San Joaquin Co., *Jepson*; Goshen, *K. Brandegee*, *Jepson* 2652; Antelope Valley, *Davy* 2249; San Bernardino, *Parish*; Studebaker, Los Angeles Co., *Braunton* 339; Owens Lake, *Jepson* 5097; Lassen Co., *Davy* 3326.

Refs.—*NITROPHILA OCCIDENTALIS* Wats. Bot. King, 297 (1871), the type spms. from the Pacific Coast. *Banalia occidentalis* Moq. DC. Prodr. 13: 279 (1849), type from Oregon, *Nuttall*.

2. APHANISMA Nutt.

Annual with alternate sessile entire leaves. Flowers minute, perfect, without bracts, axillary, solitary. Calyx 3 or 4-cleft, without appendages. Stamen 1. Ovary depressed, the short style 2 or 3-cleft. Achene depressed-globose, indurated, somewhat 5-angled, subtended at base by the closely appressed

dry calyx. Embryo annular, surrounding the copious endosperm.—One species. (Greek aphanes, inconspicuous.)

1. **A. blitoides** Nutt. Branched at the base with slender ascending stems, $\frac{1}{2}$ to 2 feet high; leaves ovate, acuminate, cordate or truncate at the sessile base, $\frac{1}{2}$ to 2 inches long, or the lowest lanceolate and long-petioled; achene $\frac{1}{2}$ line broad.

Del Mar; San Diego; Carrizo Creek. Santa Barbara Island.

Refs.—APHANISMA BLITOIDES Nutt.; Moq. in DC. Prodr. 13²: 54 (1849), type loc. San Diego, Nuttall.

3. BETA L.

Robust glabrous biennial herbs with large fleshy roots. Leaves alternate, large, long-petioled, the floral reduced and subsessile. Flowers perfect, greenish white, in sessile axillary clusters; clusters 2 or 3-flowered, disposed in paniced spikes, the flowers cohering in fruit by the enlarged bases of the calyx. Calyx 5-parted, its lobes costate dorsally, in fruit indurated and closing over the achene. Stamens 5, perigynous; filaments frequently connate at base. Ovary sunk in the succulent base of the calyx; styles 2 or 3, short, stigmatose on the inside. Achene adnate to the calyx-base. Embryo annular.—About 12 Old World species. (Perhaps Celtic bett, red, on account of the color of the root.)

1. **B. vulgaris** L. BEET. Stems stout, 2 to 6 feet high, paniculately branched above; root conical; lower leaves 4 to 10 inches long, oblong or ovate, undulate, the upper smaller, ovate-lanceolate.

Naturalized in marshes from gardens: Petaluma; Alvarado; Monterey; San Bernardino. June.

Refs.—BETA VULGARIS L. Sp. Pl. 222 (1753), type European; Jepson, Fl. W. Mid. Cal. 175 (1901).

4. CHENOPODIUM L. GOOSEFOOT. PIGWEED.

Annual or perennial herbs, frequently white-mealy or glandular, with alternate petioled leaves. Flowers perfect, greenish, bractless and sessile, clustered, the clusters commonly in simple or paniced spikes. Calyx 5 (or 3 to 4) -parted, persistent and usually enclosing the seed-like achene, rarely reduced to a single sepal. Stamens 5 or fewer. Ovary depressed; styles 2, rarely 3 or 4, slender. Achene with membranous pericarp closely investing the seed. Embryo annular, sometimes incompletely so.—About 60 species, temperate zones. (Greek chen, goose, and pous, foot, on account of the shape of the leaves.)

Fruiting calyx dry.

Annual; calyx deeply parted into lobes or segments.

Finely mealy, at least not pubescent or glandular.

Achene with pericarp closely persistent on seed.

Erect, herbage light green.....1. *C. album*.

Diffuse, herbage dark green.....2. *C. murale*.

Achene with pericarp separating readily from seed.....3. *C. fremontii*.

Glandular-pubescent and aromatic, but not mealy.

Flower-clusters spicate or paniculate.

Leaves slender-petioled; achene imperfectly enclosed by calyx; spikes cymose-diverging, leafless.....4. *C. botrys*.

Leaves slightly petioled; achene perfectly enclosed by calyx.

Spikes dense, leafy.....5. *C. ambrosioides*.

Spikes more elongated, leafless.....6. *C. anthelminticum*.

Flower-clusters all axillary.....7. *C. carinatum*.

Perennial; calyx merely toothed or cleft, more distinctly synsepalous; spike terminal, leafy only below; achene exserted.....8. *C. californicum*.

Fruiting calyx fleshy, often reddish; annual.

Calyx deciduous.....9. *C. rubrum*.

Calyx persistent, the clusters red and berry-like.....10. *C. capitatum*.

1. **C. album** L. PIGWEED. WHITE GOOSEFOOT. Erect, 2 to 4 feet high, usually paniculately branched; herbage more or less light green or white-

mealy; leaves rhombic-ovate, sinuate-dentate below or about the middle, the uppermost varying to lanceolate and subentire, 1 to 2 inches long, whiter beneath than above; flowers densely clustered in close spikes, the panicle strict and close or somewhat spreading; calyx about $\frac{3}{4}$ line wide in fruit, the lobes strongly carinate.

Common European weed in half-cultivated lands. July-Oct. Also called Lambs Quarters; the herbage makes excellent boiled greens when taken young. Var. *VIRIDE* Moq. Leaves bright green on both sides or only slightly mealy beneath; inflorescence less dense.—Widely distributed but not as common as the species.

Refs.—*CHENOPODIUM ALBUM* L. Sp. Pl. 219 (1753), type European; Jepson, Fl. W. Mid. Cal. 175 (1901). Var. *VIRIDE* Moq. in DC. Prodr. 13: 71 (1849).

C. VULVARIA L. Sp. Pl. 220 (1753). Diffuse, mealy, very ill-scented; leaves deltoid-ovate, entire; sepals not carinate.—European weed; Sacramento acc. Greene, Fl. Fr. 165.

C. GLAUCUM L. Sp. Pl. 220 (1753). Prostrate or spreading, glaucous-mealy; leaves oblong, rather coarsely 3 or 4-toothed on each side, 5 to 10 lines long, white below, green above; flower-clusters in leafless axillary spikes.—European weed, widely naturalized in U. S.; Suisun Marshes acc. Greene, Fl. Fr. 167.

2. *C. murale* L. NETTLE-LEAF GOOSEFOOT. Rather stout and succulent, the loose branches decumbent and ascending, 8 to 15 inches long; herbage dark green, the growing parts very finely mealy; leaves rhombic-ovate, irregularly and sharply toothed above the base, 1 to $1\frac{3}{4}$ inches long; flowers in rather dense axillary or terminal spicate panicles; panicles leafless, or nearly so, often very small; fruiting calyx closed; achene acutely margined.

Naturalized from Europe; a common weed in old yards and waste places, flowering through the winter.

Refs.—*CHENOPODIUM MURALE* L. Sp. Pl. 219 (1753), type European.

3. *C. fremontii* Wats. Erect, slender, branching, $\frac{1}{2}$ to 2 feet high; white-mealy to light green; leaves triangular-hastate, mostly entire, truncate or broadly cuneate at base, 5 to 7 lines long, on slender petioles half to as long, the lowest 1 to 2 inches long, the upper narrower and reduced; flower-clusters in slender spikes of the open panicle; sepals strongly carinate, nearly enclosing the achene.

Panamint Mts. acc. Coville; east to the Rocky Mts. and north to Oregon.

Refs.—*CHENOPODIUM FREMONTII* Wats. Bot. King, 287 (1871), type loc. North Platte River, *Fremont*; Cov. Contrib. U. S. Nat. Herb. 4: 179 (1893), 5: 95 (1897).

C. LEPTOPHYLLUM Nutt.; Moq. in DC. Prodr. 13: 71 (1849). Near *C. fremontii*; densely mealy or the leaves becoming green above; leaves linear, entire, acute, $\frac{1}{2}$ to $1\frac{1}{4}$ inches long.—Great Basin; to be expected on our eastern border; Lang, Los Angeles Co. acc. Parish, Bot. Gaz. 38: 460, but not reported since and perhaps an ephemeral introduction.

4. *C. botrys* L. JERUSALEM OAK. Erect, often widely branching, $\frac{1}{2}$ to 2 feet high, glandular pubescent and viscid throughout; leaves slender-petioled, ovate to oblong, $\frac{1}{2}$ to $1\frac{1}{2}$ inches long, obtuse, truncate or cuneate at base, sinuately pinnatifid and the lobes usually toothed; spikes cymose, diverging, leafless; calyx not completely enclosing the achene.

Waste places near dwellings and in flood stream beds; naturalized from Europe and widely distributed but not common. July-Sept.

Ref.—*CHENOPODIUM BOTRYS* L. Sp. Pl. 219 (1753), type European.

5. *C. ambrosioides* L. MEXICAN TEA. Erect, 2 to $3\frac{1}{2}$ feet high, usually stout and branched; herbage glabrous, scarcely glandular, when young sometimes tomentose-pubescent; leaves slightly petioled, oblong or lanceolate, 2 to 5 inches long, repand-toothed or nearly entire, the upper tapering to both ends; flowers in dense axillary clusters upon the branches, forming a leafy spike; calyx-lobes obtuse, appressed, slightly carinate, completely enclosing the achene; styles 3, sometimes 4; pericarp deciduous; seed smooth and shining, reddish, obtusely margined.

Common near salt marshes and abundant along interior streams; naturalized from tropical America; mostly autumnal. Great Valley and Coast Ranges to Southern California.

Ref.—CHENOPODIUM AMBROSIOIDES L. Sp. Pl. 219 (1753), type loc. Mexico.

6. *C. anthelminticum* L. WORMSEED. Very close to the preceding; sometimes biennial or perennial; herbage light green, glandular-puberulent and highly aromatic; leaves sinuate-serrate or the lower sometimes lacinate-pinnatifid, $\frac{3}{4}$ to 3 inches long; inflorescence a terminal mostly leafless panicle of dense but elongated slender spikes; sepals not carinate.

Not so common as the last, but appearing to hybridize with it. Naturalized from tropical America. Coast Ranges and Sacramento Valley.

Ref.—CHENOPODIUM ANTHELMINTICUM L. Sp. Pl. 220 (1753), type loc. Pennsylvania.

7. *C. carinatum* R. Br. Stems several from the base, ascending or decumbent, 5 to 13 inches long; herbage puberulent, the under side of the leaves with minute resin-globules; leaves ovate, sinuate-crenate, 3 to 6 lines long, on slender petioles $\frac{1}{2}$ to as long; flowers small, the clusters in all the axils; stamen usually 1.

Naturalized from Australia. Ione; Jackson; etc.

Ref.—CHENOPODIUM CARINATUM R. Br. Prod. 407 (1810), type loc. Australia.

8. *C. californicum* Wats. SOAP PLANT. Stout, erect or decumbent at base, $1\frac{1}{2}$ to 2 $\frac{1}{2}$ feet high from a very large carrot-like root; herbage green, scarcely at all mealy; leaves broadly triangular, truncate or cordate at base, or sub-hastate, sharply and unequally sinuate-dentate, $1\frac{1}{2}$ to 3 $\frac{1}{2}$ inches long; flowers in dense clusters in a terminal spike, leafless or leafy at the very base; calyx campanulate, barely exceeding 1 line; achene with persistent pericarp, subglobose or somewhat compressed, exserted, $\frac{3}{4}$ to 1 line broad; embryo completely annular.

Stream beds and moist slopes or swales in open foothills: Coast Ranges; Sierra Nevada foothills; south to San Diego Co. Apr.-May. The root is grated on a rock by the native tribes and used as a soap.

Locs.—Marysville Buttes, *Jepson*; Napa Co., *Jepson*; Marin Co., *Jepson*; Antioch, *Chesnut & Drew*; Berkeley, *Jepson*; Pacific Grove, *Tidestrom*; San Luis Obispo, *Roadhouse*; Antelope Valley, *Davy* 2270; San Bernardino, *Parish* 4379; Cajon Pass, north slope, *Hall* 6215; Menifee, *Alice King*.

Refs.—CHENOPODIUM CALIFORNICUM Wats. Bot. Cal. 2: 48 (1880); Blochman, *Erythea*, 2: 10 (1894); *Jepson*, Fl. W. Mid. Cal. 177 (1901). *Blitum californicum* Wats. Proc. Am. Acad. 9: 101 (1874), type from California.

9. *C. rubrum* L. RED GOOSEFOOT. Stem angled, erect, 1 to 2 feet high; herbage green or nearly so; leaves lanceolate-oblong to broadly ovate, coarsely sinuate, 1 to 2 inches long; flowers numerous in dense short axillary spikes; calyx-lobes 2 to 4, rather fleshy; stamens 1 or 2; achene shining, the margin acute.

Sparingly naturalized from Europe, in low and marshy lands: Lower Sacramento River; Alvarado Marshes; Nigger Slough and Ballona, Los Angeles Co. Sept.

Ref.—CHENOPODIUM RUBRUM L. Sp. Pl. 218 (1753), type European.

10. *C. capitatum* Asch. STRAWBERRY BLITE. Branched at base with erect or ascending stems 5 to 15 inches high; leaves hastate-triangular or lanceolate, irregularly toothed or nearly entire, $\frac{3}{4}$ to 2 inches long, on margined petioles $\frac{1}{2}$ to as long; flower clusters large, in interrupted spikes, leafy below; stamens 1 to 5; calyx berry-like in fruit.

Sierra Co., acc. Bot. Cal.; *Sisson, Jepson*. North to Alaska, east to the Atlantic.

Refs.—CHENOPODIUM CAPITATUM Asch. Fl. Brandenb. 572 (1864). *Blitum capitatum* L. Sp. Pl. 4 (1753), type European.

Jepson, Fl. Cal. vol. 1, pp. 369-432, 31 Dec. 1913.

5. **ROUBIEVA** Moq.

Heavy-scented herb, with prostrate branches. Leaves alternate, deeply pinnatifid. Flowers minute, perfect or pistillate, solitary or 2 or 3 together in the axils; calyx deeply bowl-shaped, 3 to 5-toothed, becoming saccate and contracted at the top, enclosing the fruit. Stamens 5, included. Ovary glandular at the top; styles 3, somewhat lateral, exserted. Pericarp of the achene membranous, glandular-dotted, thin and deciduous; seed lenticular; embryo annular.—One species, South America. (G. J. Roubieu, French botanist.)

1. **R. multifida** Moq. Branches 1 to 2 feet long; leaves $\frac{1}{2}$ to $1\frac{1}{4}$ inches long; calyx in fruit obovate, very conspicuously reticulate-veined.

Native of Peru; abundant on the San Francisco sand hills, and in waste places eastward to the Great Valley.

Refs.—ROUBIEVA MULTIFIDA Moq. Ann. Sc. Nat. ser. 2, 1: 293, t. 10, fig. b (1834). *Chenopodium multifidum* L. Sp. Pl. 220 (1753).

6. **MONOLEPIS** Schrad.

Low annuals with alternate fleshy leaves. Flowers polygamous, clustered in the upper axils. Sepal 1, entire, bract-like, persistent. Stamen 1. Styles 2, filiform. Achene with thin pericarp. Embryo annular around copious endosperm.—Species 3; western North America. (Greek monos, one, and lepis, scale, referring to the solitary sepal.)

Pericarp minutely pitted, adherent to the seed.....1. *M. nuttalliana*.
Pericarp minutely papillose, separating from the seed.....2. *M. spathulata*.

1. **M. nuttalliana** Greene. Pale green, branched at the base, the many stems 5 to 10 inches high; leaves linear or lanceolate with a salient tooth on each side near the middle, $\frac{1}{2}$ to 1 (or $1\frac{1}{2}$) inches long, shortly petioled or the lower petioles elongated; flower clusters dense, often reddish; sepal fleshy, foliaceous, often much exceeding the achene; pericarp minutely pitted, $\frac{1}{2}$ line broad.

Alkaline soil, occasional but widely distributed: Southern California to the Sacramento Valley and northern Sierra Nevada; east to the Great Plains. Apr.-May.

Locs.—Hat Creek, Shasta Co., Hall 4264; Dixie Mts., Lassen Co., Baker & Nutting; Mt. Ralston, Hall 4678; Donner Lake, Heller 6880; Cisco, H. A. Walker 1474; Alpine Co., Hansen; Leavitt Meadow, Congdon; Glenn Co., Davy; San Carlos Range, Jepson 2739; Bakersfield, Davy 2140; San Emigdio Cañon, Davy 2000; Menifee, Alice King; Riverside, Hall 5750; Colorado Desert, Brandegee; Capistrano, Abrams 3267.

Refs.—MONOLEPIS NUTTALLIANA Greene, Fl. Fr. 168 (1891). *Blitum nuttallianum* R. & S. Mant. 1: 65 (1822). *B. chenopodioides* Nutt. Gen. 1: 4 (1818), type loc. arid soils near the Missouri River. *Monolepis chenopodioides* Moq. in DC. Prodr. 13²: 85 (1849); Wats. Bot. Cal. 2: 49 (1880).

2. **M. spathulata** Gray. Habit of the last; leaves oblanceolate or spatulate, entire, $\frac{1}{2}$ to 1 inch long; sepal rarely exceeding the achene.

Northern Sierra Nevada from Sierra Co. (acc. Bot. Cal.) to Leavitt Meadow and Mono Pass; Panamint Mts. acc. Coville.

Refs.—MONOLEPIS SPATHULATA Gray, Proc. Am. Acad. 7: 389 (1868), type loc. Mono Pass; Wats. Bot. Cal. 2: 49 (1880); Cov. Contrib. U. S. Nat. Herb. 4: 179 (1893).

7. **ATRIplex** L. SALTBUSH.

Herbs or shrubs, usually mealy or scurfy with bran-like scales. Leaves alternate or opposite. Flowers monoecious or dioecious, in axillary clusters, or in simple or paniced spikes; staminate flowers with a regular 4 or 5-parted calyx, the pistillate consisting of a pistil enclosed between a pair of appressed foliaceous bracts, without calyx. Stigmas 2. Bracts either free or united, much enlarged in fruit, the margin usually becoming more or less expanded or foliaceous and the sides thickened, indurated, muricate or variously ap-

pendaged.—About 125 species, temperate and subtropic regions of the whole earth. (The ancient Latin name.)

A. Herbs; monoecious.

1. Annuals; inflorescence various.

Somewhat succulent and mealy; leaves petioled, the lower at least 1 inch long; staminate and pistillate flowers usually mixed in same cluster; bracts distinct or nearly so, ovate to rhombic.

Lower leaves opposite; flowers in naked or nearly naked spikes; mostly coastal.

Leaves mostly lanceolate; fruiting bracts 4 to 6 lines long.....1. *A. patula*.

Leaves triangular-hastate or deltoid; fruiting bracts $1\frac{1}{2}$ to 2 lines long.....2. *A. hastata*.

Leaves all alternate; interior species.

Leaves triangular-ovate; flowers in naked spikes; fruiting bracts 1 line long.....3. *A. spicata*.

Leaves rhomboidal-hastate; flowers in axillary clusters; fruiting bracts 3 to 4 lines long.....4. *A. phyllostegia*.

Not succulent, commonly whitish-scurfy; bracts more or less united and indurated and nut-like in fruit, the margins partly or wholly free, the sides smooth, toothed or appendaged.

Staminate and pistillate flowers mixed in axillary clusters; mostly small plants.

Stems woolly-pubescent, the branches opposite throughout or mostly so; prostrate plant; leaves mostly less than $1\frac{1}{2}$ lines long.....5. *A. parishii*.

Stems scurfy or glabrate but not woolly, the branches alternate, at least above the base; leaves small, 3 to 6 (or 10) lines long; fruiting bracts $\frac{1}{2}$ to 2 lines broad.

Decumbent plants.

Bracts narrowly margined at summit with 3 to 5 small herbaceous teeth....6. *A. microcarpa*.

Bracts narrowly margined and dentate all around.....7. *A. saltonensis*.

Erect or ascending plants.

Fruiting bracts with the margin toothed above the entire base.

Leaves cordate-ovate, sessile.....8. *A. cordulata*.

Leaves oblong-lanceolate to ovate, short petiolate or mostly sessile....9. *A. coronata*.

Fruiting bracts circular, with a toothed margin all around...10. *A. elegans*.

Staminate flowers in naked moniliform terminal spikes, the pistillate in axillary clusters; leaves mostly $\frac{1}{2}$ to 1 inch long or less (except no. 13); commonly tall plants.

Plants erect, or mostly so, 2 to 3 feet high.

Leaves oblanceolate or lanceolate; fruiting bracts 1 line broad...11. *A. coulteri*.

Leaves broadly or deltoid-ovate; fruiting bracts $2\frac{1}{2}$ to 3 lines broad.

Staminate spikes short, dense.....12. *A. argentea*.

Staminate spikes elongated, interrupted.....13. *A. expansa*.

Plants decumbent; fruiting bracts triangular.....14. *A. decumbens*.

2. Perennials; staminate flowers in terminal naked spikes, the pistillate in axillary clusters.

Interior species of alkaline flats; bracts toothed; spikes often moniliform.

Diffuse; leaves mostly sharply dentate.....15. *A. bracteosa*.

Erect and rather rigid; leaves entire.....16. *A. fruticulosa*.

Seaboard species; bracts entire; spikes usually dense.

Stems prostrate, wiry; fruiting bracts membranous, compressed.....17. *A. californica*.

Stems reclining, stout; fruiting bracts spongy, globose.....18. *A. leucophylla*.

B. Shrubs, or at least suffrutescent; dioecious.

Fruiting bracts without lateral wings.

Sides of fruiting bracts smooth, the margins entire or with very low teeth.

Fruiting bracts large, their margins free and more or less divergent.

Leaves entire, sessile or nearly so; fruiting bracts ovate.

Fruiting bracts 3 to 5 lines long; leaves not cordate...19. *A. confertifolia*.

Fruiting bracts 1 to $1\frac{1}{2}$ lines long; leaves cordate.....20. *A. parryi*.

Leaves coarsely toothed, petioled; fruiting bracts orbicular..21. *A. hymenelytra*.

Fruiting bracts small, their margins not divergent.

Branches terete; bracts united about to middle or above; axes of spikes filiform, pliable.

Bracts flattened, obscurely crenate; desert.....22. *A. lentiformis*.

Bracts convex, entire; coast.....23. *A. breweri*.

Branches striate-angled; bracts distinct but closely compressed; axes of spikes stouter, rigid.....24. *A. torreyi*.

Sides of fruiting bracts crested or mucronate, the margins lacinate or toothed.

Bracts flattened, united about $\frac{1}{3}$25. *A. polycarpa*.

- Bracts thickish, spongy, united nearly to apex.....26. *A. nuttallii*.
 Fruiting bracts with 4 very conspicuous longitudinal wings or crests.
 Wings crest-like, about 1 line broad.....27. *A. linearis*.
 Wings roundish, 3 to 5 lines broad.....28. *A. canescens*.

SECT. I.—Herbs with pistillate and staminate flowers on the same plant; annuals (nos. 1-14) or perennials (nos. 15-18).

1. *A. patula* L. SPEAR ORACHE. Stout and succulent, erect, 10 to 18 inches high, with few ascending branches; herbage green, only the growing parts somewhat mealy; leaves (the lowest often opposite) lanceolate or linear, sometimes with hastate base; inflorescence more or less leafy at base; fruiting bracts rhombic- or lance-ovate, thick and subcoriaceous, united at base, 4 to 6 lines long, entire or toothed, the sides smooth or muricate.

Common in salt marshes along the coast; Southern California to San Francisco Bay and north to British Columbia. Seacoasts of northern hemisphere.
 Refs.—*ATRIPLEX PATULA* L. Sp. Pl. 1053 (1753); Greene, Fl. Fr. 169 (1891).

2. *A. hastata* L. FAT-HEN. Rather slender, with long (1 to 2½ feet) ascending branches; herbage mealy, scarcely succulent; leaves triangular-hastate or deltoid, entire or sinuate-dentate, 1 to 2 inches long, often as broad or broader, on petioles 3 or 4 lines long; flowers in dense terminal and lateral spikes 1 to 4 inches long; fruiting bracts orbicular or triangular-ovate, 1½ (or 2) lines long, united at the cuneate base, the sides mostly toothed-crested.

Common in salt marshes about San Francisco Bay and north to Washington. Atlantic seacoast. Europe. Bracts very variable as to size and either much or little toothed, or entire. Lateral angles of the deltoid leaves often prolonged into salient lobes.

Refs.—*ATRIPLEX HASTATA* L. Sp. Pl. 1053 (1753), type European.

3. *A. spicata* Wats. Erect, 9 to 16 inches high; herbage scurfy, the stem below glabrate; leaves triangular-ovate, irregularly dentate or entire, cuspidate, 1 to 2 inches long, on petioles 1 to 6 lines long; flowers in a panicle of usually dense naked spikes; staminate calyx 4-parted; pistillate flowers nearly concealed by the staminate flowers; bracts in fruit little enlarged, ovate, acute, united to the middle or above, the apex free, the sides smooth or slightly ridged, 1 to 1½ lines long.

Low alkaline tracts of the interior valleys: Sacramento, San Joaquin and Santa Clara valleys. Occasionally exhibits a tendency to become dioecious.

Locs.—Willows, *Jepson*; Solano Co., *Jepson*; Danville, *Davy*; Mt. Diablo, *Jepson*; Warm Sprs., Alameda Co., *Jepson*; Livermore, Hollister, *Setchell*; Gilroy Valley, *Jepson*.

Refs.—*ATRIPLEX SPICATA* Wats. Proc. Am. Acad. 9: 108 (1874), type loc. near Livermore Pass, *Brewer* 1190; *Jepson*, Fl. W. Mid. Cal. 178 (1901). *A. joaquiniana* Nelson, Proc. Biol. Soc. Wash. 17: 99 (1904).

4. *A. phyllostegia* Wats. Bushy-branching, 4 to 13 inches high; herbage finally glabrous, inclined to be reddish; leaves rhomboidal-hastate with acuminate lobes, ¾ to 1¼ inches long, shortly petioled or subsessile, the blade entire, often almost as broad as long; fruiting bracts ovate or lanceolate, 4 lines long, abruptly and somewhat reniformly enlarged at base with 2 (or 4) tubercles or short ridges on the sides.

Mohave Desert; upper San Joaquin Valley; Owens Valley. Nevada.

Locs.—Goshen, *Jepson* 2651; Kern Delta, *Davy* 2139; Owens Valley, *Jepson* 930b, 5120; Keeler, *T. Brandegee*; Barstow, *Jepson* 5190; Rabbit Sprs., Mohave Desert, *Parish Bros*.

Refs.—*ATRIPLEX PHYLLOSTEGIA* Wats. Proc. Am. Acad. 9: 108 (1874). *Obione phyllostegia* Torr. in Wats. Bot. King, 291 (1871), type loc. between Truckee and Humboldt rivers, Nevada.

5. *A. parishii* Wats. Prostrate, grayish-scurfy and slightly pubescent; stems slender, 1 to 4 inches long, densely foliaceous; leaves opposite, sessile, broadly ovate, acute, 1 to 2 (or 4) lines long; fruiting bracts ovate-hastate, acute, wingless, or the pair of hastate lobes representing the wing.

Low saline spots: Solano Co.; Redondo acc. *Braunton*; Orange Co.; Palm Sprs.

Refs.—*ATRIPLEX PARISHII* Wats. Proc. Am. Acad. 17: 377 (1882), type loc. Almond (formerly Costa), S. B. & W. F. Parish. *A. depressa* Jepson in Greene, Pitt. 2: 304 (1892), type loc. Pellejo Hills, Solano Co.

6. *A. microcarpa* Dietr. Freely branching with very slender decumbent nearly glabrous branches 3 to 12 inches long; leaves thin, obovate, acute at base, abruptly acute at apex, slightly scurfy, 3 to 5 lines long, sessile or subsessile; fruiting bracts 1 line broad, the margins parallel above the acutish base and united nearly to the 3 (or 5)-toothed truncate summit, the convex sides 1 to 3-nerved, smooth or muricate.

San Pedro; San Diego; Santa Cruz and San Clemente islands; Lower California.

Refs.—*ATRIPLEX MICROCARPA* Dietr. Syn. Pl. 5: 536 (1852). *Obione microcarpa* Benth. Bot. Sulphur, 48 (1844), type loc. San Diego. *A. pacifica* Nelson, Proc. Biol. Soc. Wash. 17: 99 (1904).

7. *A. saltonensis* Parish. Stems somewhat decumbent, very leafy, 4 to 6 inches broad; herbage scurfy; leaves ovate to obovate, 3 to 5 lines long, shortly petioled; flowers axillary; bracts orbicular, 1 to 1½ lines broad with narrow margin dentate all around.

Mecca, Colorado Desert, *Parish* 8452 (type). Not otherwise known.

Ref.—*ATRIPLEX SALTONENSIS* Parish, Muhl. 9: 57 (1913).

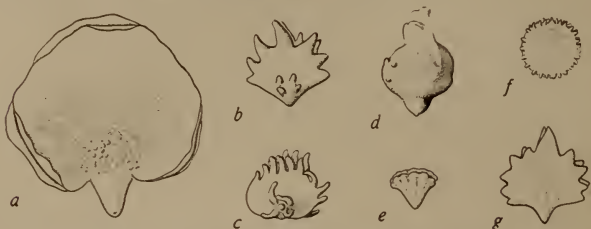


Fig. 82. Fruiting bracts of *ATRIPLEX*. *a*, *A. HYMENELYTRA* Wats.; *b*, *A. FRUTICULOSA* Jepson; *c*, *A. ELEGANS* Dietr.; *d*, *A. LEUCOPHYLLA* Dietr.; *e*, *A. PARRYI* Wats.; *f*, *A. POLYCARPA* Wats.; *g*, *A. CORDULATA* Jepson. All $\times 4$.

8. *A. cordulata* Jepson. (Fig. 82g.) Erect, the simple stems or branches commonly virgate, 7 to 15 inches high, scurfy; leaves somewhat crowded, cordate-ovate, sessile, 3 to 4 lines long; calyx 4-parted; fruiting bracts fan-shaped or somewhat rhomboidal, 1½ to 2 lines broad, much compressed, pedicellate, the margin denticulate above the middle, the terminal tooth commonly the largest, sides smooth or bearing one or more tooth-like projections.

Alkaline flats, Sacramento and San Joaquin valleys.

Var. *tularensis* Jepson n. comb. More slender, taller (up to 2¼ feet), the leaves remoter, ovate and acuminate or lanceolate; fruiting bracts 1 line broad.—Bakersfield plains.

Refs.—*ATRIPLEX CORDULATA* Jepson in Greene, Pitt. 2: 304 (1892), type loc. Little Oak, Solano Co., *Jepson*. Var. *TULARENSIS* Jepson. *A. tularensis* Cov. Contrib. U. S. Nat. Herb. 4: 182, pl. 19 (1893), type loc. Bakersfield.

9. *A. coronata* Wats. Branching at the base, 3 to 12 inches high, sometimes rather stout, white-scurfy throughout; leaves oblong-lanceolate or ovate, sessile, 3 to 8 lines long; calyx 4-parted; fruiting bracts somewhat fan-shaped,

compressed, 2 lines long and as broad, the margins crenate-dentate above the middle, the sides rarely muriculate.

Saline flats: Solano Co. southward to Santa Clara Co. May-June.

Var. **notatior** Jepson n. var. Sides copiously toothed-crested, the fruits thus globose in outline.—(Fructus utrinque dentato-cristatus copiose ad hunc modum globosus).—Dried-up lake bed, San Jacinto, *Jepson*.

Refs.—*ATRIPLEX CORONATA* Wats. Proc. Am. Acad. 9: 114 (1874), type loc. near Livermore Pass, *Brewer* 1189. *A. verna* Jepson in Greene, Pitt. 2: 305 (1892), type loc. Collinsville.

10. **A. elegans** Dietr. (Fig. 82f.) Scurfy, 3 to 10 inches high, with many ascending stems from the base; leaves obovate, usually entire, 4 to 10 lines long, sessile or the lowest petioled; fruiting bracts round, compressed, 1 to $1\frac{3}{4}$ lines broad, the somewhat convex center margined all around, the margin regularly and minutely toothed, the sides smooth.

Rabbit Sprs., Mohave Desert; Inyo Co. acc. *Coville*; Colorado Desert; east to New Mexico and south into Mexico.

Refs.—*ATRIPLEX ELEGANS* Dietr. Syn. Pl. 5: 537 (1852). *Obione elegans* Moq. in DC. Prodr. 13²: 113 (1849), type from Sonora, Mex., *Coulter*. *A. fasciculata* Wats. Proc. Am. Acad. 17: 377 (1882), type loc. Fish Ponds, Mohave Desert, *S. B. & W. F. Parish*.

11. **A. coulteri** Dietr. Erect with very slender branches, 1 to 3 feet high, or sometimes diffusely spreading, the very base woody; leaves oblanceolate or lanceolate, $\frac{1}{2}$ to 1 inch long, entire, mucronulate, sessile or the lowest petioled; fruiting bracts roundish, 1 line broad, with a narrow herbaceous laciniate toothed border which reaches nearly to the base, the convex sides reticulate-veiny, smooth or rarely muricate.

San Diego northerly to Capistrano and Ramona; Santa Catalina Island.

Refs.—*ATRIPLEX COULTERI* Dietr. Syn. Pl. 5: 537 (1852). *Obione coulteri* Moq. in DC. Prodr. 13²: 113 (1849), type from California, *Coulter*.

12. **A. argentea** Nutt. SILVER ORACHE. Erect, branching, $\frac{1}{2}$ to $1\frac{1}{2}$ feet high, gray-scurfy or glabrate, the upper side of the leaves greener; leaves triangular-ovate or substate-ovate, acute, dentate or entire, $\frac{3}{4}$ to 1 inch long, shortly petioled, or the upper sessile; flowers in axillary clusters, the staminate in the upper axils or in spikes; fruiting bracts roundish, spongy-thickened, 3 lines long, with an herbaceous irregularly toothed margin above the short turbinate or pedicellate base, one or both the sides with herbaceous teeth or lamellae.

Inyo Co. acc. *Coville*; Siskiyou Co., *Butler* 1066, 1841; Sierra Co. acc. Bot. Cal.; north to Washington, east to the Rocky Mts.

Refs.—*ATRIPLEX ARGENTEA* Nutt. Gen. 1: 198 (1818), type loc. "saline places near the Missouri"; Wats. Bot. Cal. 2: 53 (1880); Cov. Contrib. U. S. Nat. Herb. 4: 180 (1893).

13. **A. expansa** Wats. FOG-WEED. Erect, much branched, 2 to $3\frac{1}{2}$ feet high; finely mealy-scurfy; leaves broadly ovate or deltoid-ovate, irregularly and sharply toothed or entire, 1 to 3 inches long, often as broad as long, the lower on stout petioles 1 to 10 lines long and 3-nerved from the base, the upper reduced to sessile and more or less cordate floral bracts as broad as (or broader than) long; spikes elongated, slender; fruiting bracts sessile, roundish, mostly 3-nerved, 2 to 3 lines broad, the margin sharply toothed, the sides smooth or with a few irregular projections or crests.

Low alkaline areas of the interior: Sacramento Valley; south to Los Angeles and San Diego; east to New Mexico. Very abundant in the lower San Joaquin, a useful fodder plant if cut in May.

Locs.—San Joaquin Co., *Jepson*; upper San Joaquin Valley, *Davy* 2910; Santa Monica, *Parish Bros.*; Ramona, *K. Brandegee*; Westminster, Orange Co., *McClatchie*.

Refs.—*ATRIPLEX EXPANSA* Wats. Proc. Am. Acad. 9: 116 (1874), type loc. s.w. U. S. *A. nodosa* Greene, Pitt. 1: 40 (1887), from Antioch, is an insect-stung monstrosity. *A. trinervata* Jepson in Greene, Pitt. 2: 305 (1892), type loc. Araquipa Hills, Solano Co. *Vai. mohavensis* Jones, Contrib. 11: 20 (1903), type loc. Mohave Desert to San Bernardino.

14. *A. decumbens* Wats. Stems trailing, 1 to 3 feet long; leaves alternate or the upper mostly opposite, finely hoary, ovate, 4 to 9 lines long, sessile; fruiting bracts triangular, truncate at base, 3 to 4 lines long, nearly as broad, united to the middle, the sides smooth; margins denticulate, their lower $\frac{1}{4}$ united.

Coast from San Diego to Long Beach; Santa Catalina Island.

Refs.—*ATRIPLEX DECUMBENS* Wats. Proc. Am. Acad. 12: 275 (1876), type loc. San Diego, Palmer 334. *A. watsonii* Nelson in Abrams, Fl. Los. Ang. 128 (1904).

15. *A. bracteosa* Wats. More or less diffuse, the stems 1 to several feet long; branches smooth and shining, straw-color; leaves finely grayish scurfy, greener above, oblong-ovate, mucronate-acute, or acuminate, $\frac{1}{2}$ to 2 inches long, thin, sharply but sparingly toothed or the smaller entire; fruiting bracts whitish, 1 to $1\frac{1}{2}$ lines long, the herbaceous margin laciniately toothed, or simply dentate with the central tooth lanceolate and conspicuous.

Moist saline soil, Great Valley to Southern California. Aug.-Oct.

Locs.—Princeton, Colusa Co., Chandler; Tyler Island, lower Sacramento, Jepson; Visalia, Congdon; Bakersfield, Davy 2886; San Bernardino, Parish 4195; Los Angeles, Braunton; Riverside, Hall; Temescal Wash, Jepson 1578; Elsinore, McClatchie; San Diego, K. Brandegee.

Refs.—*ATRIPLEX BRACTEOSA* Wats. Proc. Am. Acad. 9: 115 (1874). *Obione bracteosa* Dur. & Hilg., Pac. R. Rep. 5th: 13, pl. 14 (1855), type loc. Posé Creek, Kern Co., Heermann. *A. coronata* Jepson, Erythea, 1: 244 (1893), not Wats. *A. serenana* Nelson in Abrams, Fl. Los Ang. 128 (1904).

A. SEMIBACCATA R. Br. Prodr. 406 (1810). Diffusely spreading perennial, the stems woody below; leaves oblong, sinuate-toothed or entire, $\frac{1}{2}$ to 2 inches long; fruiting bracts rhomboidal, acute, stipe-like at base, united about one-half, toothed at the lateral angles, 2 to 3 lines long, smooth on the 3-nerved sides.—Native of Australia, cultivated as a forage plant and becoming spontaneous along the coast, especially southward, and in the Colorado Desert.

16. *A. fruticulosa* Jepson. (Fig. 82b.) Stems several from the base, erect, simple below, with terminal branchlets, 6 to 13 inches high, slightly woody at base; herbage grayish; leaves sessile, lanceolate or narrowly oblong, $\frac{1}{4}$ to $\frac{3}{4}$ inch long; fruiting bracts $1\frac{1}{2}$ to 2 lines long and about as broad, the margins toothed above the base, the sides tooth-crested.

Alkaline flats of the Great Valley from the "goose-lands" of Glenn Co. south into the San Joaquin.

Refs.—*ATRIPLEX FRUTICULOSA* Jepson in Greene, Pitt. 2: 306 (1892), type loc. Little Oak, Solano Co., Jepson; Fl. W. Mid. Cal. 180 (1901).

17. *A. californica* Moq. Stems from a fleshy fusiform root, slender, wiry, mostly herbaceous, prostrate, often much branched and forming a thick mat; herbage finely white-mealy, but the general hue mostly greenish; leaves thin-nish, ovate-lanceolate to oblong-lanceolate, 2 to 7 lines long, sessile or shortly petioled; flowers in mixed axillary clusters, or the staminate mostly in terminal spikes; fruiting bracts membranous, ovate, acute, entire, loosely closed over the utricle, but not united, 1 to 2 lines long.

Sandy beaches or bluffs along the coast from Marin Co. to San Diego and Lower California. Apr.-May.

Locs.—Pt. Reyes, Davy 6764; Mare Island, Greene; West Berkeley, Jepson; San Francisco; Santa Cruz; Monterey; Redondo; Santa Barbara Islands (Zoe, 1: 144).

Refs.—*ATRIPLEX CALIFORNICA* Moq. in DC. Prodr. 13^e: 98 (1849), type from California, Coulter; Greene, Pitt. 1: 207 (1888); Jepson, Fl. W. Mid. Cal. 180 (1901).

18. *A. leucophylla* Dietr. (Fig. 82d.) Stems prostrate, often somewhat woody at base, 1 to several feet long, the branches usually many, short, ascending, very leafy, often almost imbricated-leafy; herbage densely scurfy, light brown, sometimes pinkish; leaves thick, orbicular to elliptic or elliptic-ovate, entire, 4 to 8 (or 12) lines long, sessile, 3-nerved; calyx rather large, 5-cleft; fruiting bracts subglobose, $1\frac{1}{2}$ to 2 lines long, with the bracts completely united and marginless (except at the apex where there is a small

ovate double wing) and the sides commonly with two (or several) warty projections.

Seabeaches, very common; San Francisco to Southern California and the Santa Barbara Islands. June-Dec.

Refs.—*ATRIPLEX LEUCOPHYLLA* Dietr. Syn. Pl. 5: 536 (1852). *Obione leucophylla* Moq. in DC. Prodr. 13²: 109 (1849), type from California, *Chamisso*.

Sect. II.—Shrubs, or at least woody at base, with staminate and pistillate flowers on different plants.



Fig. 83. *ATRIPLEX CONFERTIFOLIA* Wats.; fruiting bracts, x 4.

19. *A. confertifolia* Wats. SPINY SALTBUSH. (Fig. 83.) Compact round bushes 1 to 2 feet high, more or less spiny; flowers in subpaniculate spikes, in fruit very dense; leaves ovate or elliptic, entire, rounded at apex, abruptly cuneate at base, 3 to 8 lines long, very shortly petioled; fruiting bracts sessile, round-ovate or subdeltoid, acutish or mostly obtuse, truncate or subcordate at base, 4 to 10 lines long, entire or sometimes dentate, united around the seed, the dilated margins otherwise free and more or less spreading, the sides smooth.

Common on mesas and hills of the Mohave Desert: North to Inyo and Lassen cos.; east to Colorado, thence south to Mexico. Not in the Colorado Desert.

Locs.—Antelope Valley, *Davy*; Barstow, *Jepson* 4783, 5170; Owens Lake, *Jepson* 5132; Honey Lake Valley, *Davy* 3274.

Biol. Note.—After losing their fruits the branches of the short panicle become rigid and spinescent. Such naked spiny branches persist for several years and provide considerable protection for the bush against the attacks of grazing animals. All the shrubby species exhibit similar characteristics in greater or less degree, but in none other of our species is the spini-ness so effectively developed as in *A. confertifolia*.

Refs.—*ATRIPLEX CONFERTIFOLIA* Wats. Proc. Am. Acad. 9: 119 (1874). *Obione confertifolia* Torr. & Frem. in Frem. Sec. Rep. 318 (1845), type loc. Salt Lake, Utah.

20. *A. parryi* Wats. PARRY SALTBUSH. (Fig. 82e.) Densely branching white-scurfy rounded bush 8 to 16 inches high, near the preceding but the rigid spinosely tipped branches more numerous and slender; leaves thick, round-cordate, obtuse or acute, sessile, 2 to 6 lines broad; flower-clusters axillary; fruiting bracts very small ($\frac{3}{4}$ to $1\frac{1}{2}$ lines long), somewhat fan-shaped, united to above the middle, abruptly dilated above the broadly cuneate base, the free margin short but broad and with a few low teeth, the sides smooth.

Antelope Valley and northeasterly through the Mohave Desert to Owens Lake and Lone Pine, *Jepson* 5145, 5149; Death Valley and southern Nevada acc. *Coville*.

Refs.—*ATRIPLEX PARRYI* Wats. Proc. Am. Acad. 17: 378 (1882), type loc. Lancaster, *Parry*; Cov. Contrib. U. S. Nat. Herb. 4: 181 (1893); Merriam, N. Am. Fauna, 7: 325 (1893); Parish, Zoe, 5: 113 (1901).

21. *A. hymenelytra* Wats. DESERT HOLLY. (Fig. 82a.) Compactly branching, 1 to 3 feet high, the stems from thickened and often very gnarled woody bases 1 inch in diameter; herbage covered with dense smooth silvery-white scurf; leaves roundish, $\frac{1}{2}$ to $1\frac{3}{4}$ inches broad, somewhat cordate at base, the undulate margin with coarse salient teeth, the petioles 3 to 6 lines long; flower clusters in panicle spikes; fruiting bracts on a short clavate pedicel, round-reniform, strongly flattened, entire, $2\frac{1}{2}$ to 6 lines broad, distinct or nearly so, the margins entirely free and sides smooth.

Colorado and Mohave deserts north to Owens Valley; east to Utah. Also called Silver Holly.

Refs.—*ATRIPLEX HYMENELYTRA* Wats. Proc. Am. Acad. 9: 119 (1874). *Obione hymenelytra* Torr. Pac. R. Rep. 4: 129, pl. 20 (1856), type loc. Williams River, Ariz.

22. **A. lentiformis** Wats. QUAIL BRUSH. (Fig. 84.) Widely spreading shrub 6 to 10 feet high and half again as broad; branches divaricate, occasionally spinescent; herbage closely scurfy; leaves ovate or triangular-hastate, rounded at apex, $\frac{1}{2}$ to $1\frac{1}{2}$ inches long, on short petioles; fruiting spikes dense, naked, pliable, in compact panicles. 4 to 8 inches long; calyx 5-cleft; fruiting bracts roundish, flattened, 1 to 2 lines broad, united by their edges to the middle or above, the sides smooth and the free margins obscurely crenulate.

Alkaline flats and river benches: upper San Joaquin Valley; Mohave and Colorado deserts; Arizona.

Locs.—Upper San Joaquin Valley, *Eastwood*; Chemehuevis Valley, Colorado River, *Jepson* 5197; Whipple Mts., *Jepson* 5217; Colorado Desert, *Parish* 8265 (Dos Palmos), 8264 (Mecca).

Refs.—*ATRIPLEX LENTIFORMIS* Wats. Proc. Am. Acad. 9: 118 (1874). *Obione lentiformis* Torr. in Sitgreaves Exped. 169, pl. 14 (1853), type loc. Colorado River, Cal.

23. **A. breweri** Wats. Very near preceding, 4 to 6 feet high; calyx 4-cleft; fruiting bracts spongy, drab-color, rounded, somewhat convex, united to near the middle, entire, $1\frac{1}{2}$ to 3 lines broad.

Coast from Santa Barbara to Santa Monica and San Juan Capistrano. Santa Cruz Island.

Refs.—*ATRIPLEX BREWERI* Wats. Proc. Am. Acad. 9: 119 (1874), types from Santa Monica and Santa Barbara; *Parish*, *Erythea*, 7: 91 (1899). *A. orbicularis* Wats. Proc. Am. Acad. 17: 377 (1882), type loc. Santa Monica.

24. **A. torreyi** Wats. NEVADA SALT-BUSH. Leafy bush 2 to 5 feet high, densely and divaricately branched, the branches striately angled, somewhat spiny with the lateral axes of the old panicles; leaves ovate-hastate or broadly oblong, $\frac{1}{2}$ to $1\frac{1}{2}$ inches long on petioles 1 to 4 lines long; flowers in narrow panicles; fruiting bracts roundish or transversely elliptic, $1\frac{1}{2}$ to 2 lines broad, distinct, strongly compressed, with denticulate (sometimes smooth) margins and smooth veiny sides.

Alkaline desert flats: Mohave Desert; Inyo Co.; Nevada; east to Utah.

Locs.—Barstow, *Jepson* 4791, 5174, 5434; Lone Pine, *Jepson* 5146.

Refs.—*ATRIPLEX TORREYI* Wats. Proc. Am. Acad. 9: 119 (1874). *Obione torreyi* Wats. Bot. King, 5: 290 (1871), types from dry valleys of the Truckee and Carson rivers, Nev.

25. **A. polycarpa** Wats. CATTLE SPINACH. (Fig. 82c.) Light-gray shrub 2 to $3\frac{1}{2}$ feet high, with slender rigid branches and numerous more or less spiny branchlets; leaves thick, obovate to oblong-spatulate, obtuse, sessile,



Fig. 84. *ATRIPLEX LENTIFORMIS* Wats. *a*, fruiting branch, x 1; *b*, fruiting bracts, x 4.

those of the vegetative branches 4 to 7 or 10 lines long, deciduous during the high heat period, those of the fruiting branches very small (1 to 4 lines long), with smaller ones fascicled in the axils; flowers in close naked panicle spikes; fruiting bracts roundish, united about $\frac{1}{3}$, 1 to 2 lines broad, commonly broader than long, laciniately or unequally toothed, the sides with 2 or more slender spreading teeth or tubercular crests or sometimes quite smooth.

Desert bottoms and flats and river benches: Colorado and Mohave deserts; north to Inyo Co.; San Joaquin Valley; Arizona. Fl. June; fr. Sept.-Oct.

Locs.—Calexico, *Parish* 8261; Mecca, *Parish* 8262; Whipple Mts., *Jepson* 5215; Barstow, *Jepson* 4800, 5173; Owens Lake, *Jepson* 5104; Alabama Hills, *Jepson* 918; Bakersfield, *Davy* 2137, 2402, 2884; Los Baños, *Grinnell*.

Refs.—*ATRIPLEX POLYCARPA* Wats. Proc. Am. Acad. 9: 117 (1874); Merriam, N. Am. Fauna, 7: 325 (1893). *Obione polycarpa* Torr. in Emory, Mil. Recon. 150 (1848), type loc. Williams River, Ariz.

26. *A. nuttallii* Wats. NUTTALL SALTBUSH. Diffuse shrub 1 to 2 feet high; leaves obovate to oblong or linear, entire, narrowed to a short petiole or sessile, 1 to 2 inches long; flowers in sparingly naked panicle spikes; fruiting bracts ovate, convex, united except at apex, 2 to 5 lines long, sessile or raised on a pedicel 2 lines long, the margin commonly 3-toothed at apex, the middle tooth often largest and the lateral small or wanting, the sides irregularly and often copiously tooth-crested.

Honey Lake Valley, Lassen Co., *Davy*; east to the Rocky Mts.

Ref.—*ATRIPLEX NUTTALLII* Wats. Proc. Am. Acad. 9: 116 (1874), type west American.

27. *A. linearis* Wats. Shrub, more woody than *A. nuttallii*; leaves linear or narrowed towards the base, $\frac{1}{2}$ to $1\frac{1}{2}$ inches long; staminate flowers in small globose clusters, in simple or panicle spikes, leafy below; pistillate flowers solitary or few together in similar spikes, more leafy; fruiting bracts lanceolate or ovate, 2 to 4 lines long, prolonged above into a narrow tip, the sides irregularly tuberculate or crested and developing 4 deeply toothed wings. Colorado Desert; south into Mexico.

Locs.—Durmid, *Parish* 8073. Referred here provisionally are plants of the Argus Mts., Inyo Co., *Purpus* 5409, or these may belong to *A. aptera* Nelson (Bot. Gaz. 34: 356,—1902, type loc. Laramie).

Refs.—*ATRIPLEX LINEARIS* Wats. Proc. Am. Acad. 24: 72 (1889), type loc. Guaymas, Sonora, *Palmer* 120, 121, 235.



Fig. 85. *ATRIPLEX CANESCENS* James; fruiting bracts, x 4.

28. *A. canescens* James. SHAD-SCALE. (Fig. 85.) Roundish gray shrub 1 to 5 feet high; leaves linear, entire, narrowed at base, $\frac{3}{4}$ to $1\frac{1}{4}$ inches long, finely scurfy-canescens; flowers mostly dioecious in elongated narrow spike-like panicles, very dense in fruit; fruiting bracts forming a thick hard body 2 to 4 lines long, tipped at apex with 2 lanceolate teeth 1 line long and laterally margined by 4 roundish very conspicuous wings 3 to 6 lines long and 2 to 4 lines broad; wings decurrent at base on the pedicel and overtopping the free apex, the margin irregularly dentate or laciniate.

Desert flats or washes, Mohave and Colorado deserts west to San Bernardino and San Diego; east to Nevada and Dakota and south into Mexico.

Locs.—San Diego, *Palmer*; Imperial, *Parish* 8259; San Bernardino, *Parish*; Barstow, *Jepson* 5171; Argus Mts., *Hall & Chandler*, 7067; Owens Lake, *Jepson* 5105; Colorado River near Williams Fork, *Jepson* 5225; Holtville, *Parish* 8077.

Very variable in its fruiting bracts. The original or Great Plains plant has densely scurfy wings. Along the Colorado River are plants with very broad and only slightly scurfy fruit wings. With their slender branches crowded with sea-green fruits and bending outwards or towards the ground, these shrubs are not unhandsome objects and are somewhat different in appearance from many forms of the Mohave and Colorado deserts with scurfy fruits and often much reduced or toothed wings.

Var. *laciniata* Parish n. var. Wings 3 or 4 lines broad, saliently lacinate. —(Alae lin. 3-4 latae, profunde laciniatae.)—Caleb, Colorado Desert, *Parish* 8256. Also occurring in the Mohave Desert (Barstow, *Jepson* 5171a). Passing into the next.

Var. *macilenta* Jepson n. var. Wings much reduced, $\frac{3}{4}$ to $1\frac{1}{2}$ lines broad, coarsely toothed.—(Alae perminutae, lin. $\frac{3}{4}$ - $1\frac{1}{2}$ latae, dentatae.)—Holtville, Colorado Desert, *Parish* 8258. Not uncommon in the southern part of the Colorado Desert. Aspect very different from the type.

Refs.—*ATRIPLEX CANESCENS* James, Cat. 178 (1825); Merriam, N. Am. Fauna, 7: 326 (1893). *Calligonum canescens* Pursh, Fl. 2: 370 (1814), type loc. Big-bend of the Missouri.

8. GRAYIA H. & A.

Low shrubs with alternate entire leaves. Flowers dioecious or sometimes monoecious, in axillary clusters or terminal spikes. Staminate flowers without bracts; calyx mostly 4-parted; stamens 4 or 5, with short subulate filaments. Pistillate flowers without calyx, the ovary enclosed in an orbicular strongly flattened membranous sac with a small orifice at the apex and bordered all around with a narrow wing; sac really composed of 2 conduplicate bracts united by their edges nearly to the apex, each bract with a wing developed on the back or midrib, the whole much enlarged in fruit. Styles 2. Achene with very thin pericarp.—Two species, Great Basin region. (Asa Gray, 1810-1888, distinguished American botanist.)

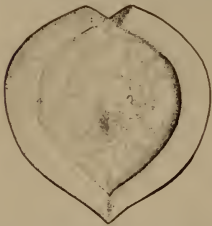


Fig. 86. GRAYIA SPINOSA Moq.; fruiting bracts, $\times 4$.

1. G. spinosa Moq. HOP SAGE. (Fig. 86.)

Deep green shrub $1\frac{1}{4}$ to 3 feet high, the branches frequently spinescent; young parts mealy, finally glabrous; leaves rather fleshy, linear-oblongate or obovate, 4 to 15 lines long, barely petioled; staminate flowers in axillary clusters, the pistillate mostly spicate; fruiting bracts round, 3 to 6 lines in diameter, sessile, entire, glabrous, thin, white or pinkish, emarginate, abruptly narrowed below to a short cuneate pedicel-like base, or the pedicel often obscure or obsolete; styles slender, at first exserted.—Alkaline valleys: Mohave Desert to Owens Valley; north to Washington and east to Wyoming.

Locs.—Antelope Valley, *Hall* 3036; Barstow, *Jepson* 4833; Panamint Mts., *Hall & Chandler* 6992; Big Pine, *Hall & Chandler* 7227; Argus Mts., *Purpus* 5481; Honey Lake Valley, *Davy* 3273.

Refs.—GRAYIA SPINOSA Moq. in DC. Prodr. 13⁷: 119 (1849); Merriam, N. Am. Fauna, 7: 328 (1893). *Chenopodium ? spinosum* Hook. Fl. Bor. Am. 2: 127 (1838), type loc. Columbia River basin, *Douglas*. *Grayia polygaloides* H. & A. Bot. Beech. 388 (1840); Hook. Icon. Pl. 3, pl. 271 (1840); Kennedy, Univ. Nev. Agr. Exp. Bull. 55: 36 (1903).

9. EUROTIA Adans.

Low white-tomentose shrubs with alternate entire leaves. Flowers dioecious or monoecious, in small axillary clusters, the clusters spicately disposed at the ends of the branches. Staminate flowers without involucrel bracts; calyx hairy, 4-parted; stamens 4, exserted. Pistillate flowers without calyx; pistil enclosed in a membranous densely silky-hairy sac composed of two bracts united above the middle and with spreading apices; styles 2, slender, exserted.

Sac in fruit enlarged, 4-angled, beaked above by two short horns.—Two species, the second in Europe-Asia. (Greek euros, mould, referring to the hairy or rufous covering.)



Fig. 87. *EUROTIA LANATA* Moq.; fruiting branchlet, x 1.

1. *E. lanata* Moq. WINTER FAT. (Fig. 87.) Branches slender, usually many from the woody stems, 1 to 2 feet high, the herbage stellately white-tomentose or in age reddish; leaves linear with strongly revolute margins, $\frac{3}{4}$ to $1\frac{1}{4}$ inches long or the axillary fascicled ones mostly 1 to 6 lines long; fruiting involucre 2 or 3 lines long, ornamented with 4 dense spreading tufts of silvery-white hairs; ovary densely white-hairy.

Subalkaline soils of the Colorado and Mohave deserts; upper San Joaquin Valley (Rosamond, Sunset) and the neighboring inner Coast Range at Goodwin; Owens Valley north to Honey Lake Valley; east to New Mexico and far northward to Washington and Saskatchewan. Often abundant in the desert valleys and prized by the cattlemen for winter forage; they sometimes call it "White Sage" or "Sweet Sage."

Refs.—*EUROTIA LANATA* Moq. Enum. Chenop. 81 (1840); Cov. Contrib. U. S. Nat. Herb. 4: 182 (1893); Brandegee, Zoe, 4: 159 (1893); Kennedy, U. S. Dept. Agr. Div. Agros. Bull. 22: 84 (1900); Merriam, N. Am. Fauna, 7: 329 (1893). *Diotis lanata* Pursh, Fl. 2: 602 (1814), type loc. open prairies, Missouri River, Capt. Lewis.

10. *KOCHIA* Roth.

Perennial herbs, woody at very base. Leaves linear, terete, entire. Flowers perfect, solitary or few in the axils of the virgate leafy stems, without bracts. Calyx herbaceous, subglobose, shortly 5-lobed, persistent over the fruit, and finally developing 5 horizontal wings. Stamens 5, usually exserted. Ovary depressed; styles 2 or 3, filiform. Achene with membranous persistent pericarp. Embryo nearly annular, green; endosperm none.—About 30 species in the Old World (all continents) and 2 in N. Am. (W. D. J. Koch, one time Director of the Botanic Garden at Erlangen.)

Herbage grayish or glabrate; leaves ascending.....1. *K. americana*.
Herbage grayish or rusty; leaves spreading.....2. *K. californica*.

1. *K. americana* Wats. Stems many from the branching crown of a woody root, erect, 5 to 11 inches high; stems whitish-tomentulose, the leaves silky-pilose, both finally glabrate and greenish; leaves narrowly linear, 4 to 7 lines long, ascending or strict; calyx densely white-tomentose or partly glabrate; wings fan-shaped, membranous, striate, toothed or erosulate, 1 line long.

Desert valleys: Honey Lake Valley; Inyo Co.; east to Colorado.

Refs.—*KOCHIA AMERICANA* Wats. Proc. Am. Acad. 9: 93 (1874); Nelson, Coulter's New Man. Rocky Mts. 164 (1909).

2. *K. californica* Wats. Stems many from a branched woody crown, erect, branching, 6 to 15 inches high; both stem and leaves rusty or grayish with a dense silky tomentum; leaves narrowly oblong, spreading, 2 to 6 lines long; calyx densely tomentose; fruiting calyx not seen.

Western Madera Co.; Bakersfield; Mohave Desert from Desert Well (Iron Mt.) west to Rabbit Sprs. and Antelope Valley. Ash Meadows, Nevada, acc. Coville.

Refs.—*KOCHIA CALIFORNICA* Wats. Proc. Am. Acad. 17: 378 (1882), types from Lancaster, Parry, and Rabbit Sprs., Mohave Desert, S. B. & W. F. Parish; Parish, Zoe, 5: 113 (1901).

11. **SPIROSTACHYS** Wats.

Shrub with alternate leafless jointed branches; the branchlets fleshy and green with short scale-like leaves. Flowers perfect, arranged spirally by threes in a crowded spike, in the axils of fleshy subsessile bracts. Calyx of 4 (or 5) concave carinate imbricated sepals, more or less united. Stamens 1 or 2, with slender filaments at length exserted. Ovary oblong; styles 2, rarely 3, commonly distinct. Achene with membranous pericarp, free from the vertical oblong seed. Embryo green, nearly surrounding the rather copious endosperm.—Three species, 2 in S. Am. (Greek *speira*, a coil or spiral, and *stachus*, a spike.)



Fig. 88. **SPIROSTACHYS**
occidentalis Wats.;
flowering spikes, x 1.

1. **S. occidentalis** Wats. **IODINE BUSH.** (Fig. 88.) Erect, diffusely branched, 2 to 4 feet high; vestiges of leaves very short, broadly triangular and amplexicaul, acute, often nearly obsolete; spikes numerous, sessile or nearly so, cylindrical, 3 to 10 lines long; bracts rhomboidal; flowers crowded, slightly exserted; calyx becoming spongy and enclosing the fruit.

Moist alkaline clay soil: San Joaquin Valley; Inyo Co. south to Chemehuevis Valley on the Colorado River, east to Texas. Very abundant in the upper San Joaquin Valley.

Refs.—**SPIROSTACHYS OCCIDENTALIS** Wats. Proc. Am. Acad. 9: 125 (1874). *Halostachys occidentalis* Wats. Bot. King, 293 (1871), type from the Great Basin. *Allenrolfea occidentalis* Ktze. Rev. Gen. Pl. 546 (1891); Jepson, Fl. W. Mid. Cal. 181 (1901).

12. **SALICORNIA** L. **SAMPHIRE.** **GLASSWORT.**

Low very succulent herbs with jointed stems and opposite terete branches. Leaves reduced to mere opposite scales at the nodes, the flowers immersed in the axils of the scales of the thickened upper joints and forming a cylindrical spike. Flowers disposed in opposite clusters of 3, all perfect or the lateral ones of each trio often only staminate. Calyx small and bladder-like, with an anterior opening, in fruit spongy and deciduous. Stamens 2, exserted in flower. Ovary oblong; styles 2 or 3, short. Achene with membranous pericarp, adherent to the seed. Embryo folded, the

cotyledons incumbent upon the caulicle; endosperm none or almost none.—Ten species, all continents. (Latin *sal*, salt, and *cornu*, horn, plants of saline habitat with horn-like branches.)

Perennial by rootstocks; flowers of a trio all of the same height.

Spikes slender, narrower than stems.....1. *S. ambigua*.

Spikes rather thicker than stems.....2. *S. subterminalis*.

Annuals; middle flower higher than the lateral.

Joints of spikes longer than broad.....3. *S. europaea*.

Joints of spikes broader than long.....4. *S. mucronata*.

1. **S. ambigua** Michx. **PICKLE-WEED.** (Fig. 89.) Stems erect, or decumbent and rooting at the joints, 5 to 12 inches long, from woody rootstocks; herbage greenish; internodes rather long; spikes slender, usually narrower than the stem, all the scales flower-bearing to the top; achene pubescent.

Salt marshes along the coast: San Francisco and Suisun bays south to San Pedro and Lower California, north to British Columbia. Atlantic coast.

Ref.—**SALICORNIA AMBIGUA** Michx. Fl. Bor. Am. 1: 2 (1803), type loc. the Carolinas.

2. **S. subterminalis** Parish. Stems widely spreading or erect and compact, ½ to 1 foot high, from running rootstocks; internodes short; branchlets very

numerous, each pair often turned to one side, giving the stem a unilateral appearance; spikes 1 to 2 inches long, of few to several enlarged broad flower-bearing scales and terminated by about as many long slender sterile ones; achene glabrous.

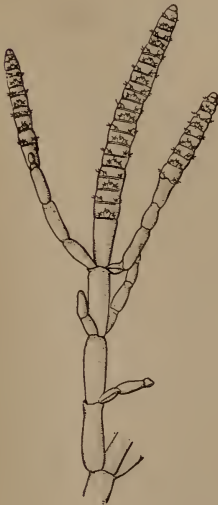


Fig. 89. *SALICORNIA AMBIGUA* Michx.; flowering spikes, x 1.

dioecious, without bracts. Staminate flowers in terminal catkin-like spikes without calyx and with spirally arranged scales; stamens 2 to 5 under a stipitate peltate scale; filaments short. Pistillate flowers axillary and com-

Santa Monica to San Diego, east to Meniffee and Perris and north to Bakersfield.

Refs.—*SALICORNIA SUBTERMINALIS* Parish, *Erythea*, 6: 87 (1898), type loc. western Riverside Co., *Parish* 1520, 4463; l. c. 7: 92 (1899); Abrams, *Fl. Los Ang.* 130 (1904).

3. *S. europaea* L. Erect compactly branching annual 3 to 9 inches high; spikes slender, 1 line wide, mostly tapering toward tip, the joints much longer than broad; scales with blunt or very shortly acute tips; middle flower much higher than the lateral, shorter than the joints; fruiting calyx with raised spongy margin about a central crest.

Alkaline marshes, chiefly in the desert region: San Diego; Tehachapi Valley, acc. *Coville*; Modoc Co.; Palo Alto. Atlantic coast; Europe; Asia.

Ref.—*SALICORNIA EUROPAEA* L. *Sp. Pl.* 3 (1753). *S. herbacea* L. *Sp. Pl.* ed. 2, 1: 5 (1762); Parish, *Erythea*, 7: 91 (1899).

4. *S. mucronata* Bigel. Habit of the preceding; spikes thick-cylindric, $2\frac{1}{2}$ to 3 lines broad, not tapering, the joints broader than long; scales with acuminate points; middle flower half higher than the lateral, occupying the whole joint; fruiting calyx with flattish anterior face.

San Diego; east to the Atlantic.

Refs.—*SALICORNIA MUCRONATA* Bigel. *Fl. Bost.* ed. 2, 2 (1824), type loc. e. Mass. *S. bigelovii* Torr. *Bot. Mex. Bound.* 184 (1859).

13. *SARCOBATUS* Nees.

Rigid and divaricately branched compact shrub with somewhat thorny branches. Leaves alternate, linear, sessile, entire. Flowers monoecious or dioecious, without bracts. Staminate flowers in terminal catkin-like spikes without calyx and with spirally arranged scales; stamens 2 to 5 under a stipitate peltate scale; filaments short. Pistillate flowers axillary and com-



Fig. 90. *SARCOBATUS VERMICULATUS* Torr. a, staminate inflorescence, x 1; b, pistillate inflorescence, x 1; c, fruit, x 4.

monly solitary, sessile; ovary set in a sac-like adherent calyx; style short; stigmas 2, spreading horizontally; calyx laterally margined by a narrow border which becomes in fruit a broad circular horizontal wavy membranous wing.—One species, western N. Am. (Greek sarcx, flesh, and batos, thicket.)

1. *S. vermiculatus* Torr. BLACK GREASEWOOD. (Fig. 90.) Branches closely interlocking, 3 to 5 feet high; bark white; leaves $\frac{1}{2}$ to $\frac{3}{4}$ inches long, fleshy, flat on the upper side, rounded beneath, usually glabrous; staminate spikes 7 to 10 lines long; fruiting calyx with prominently veined wing, 4 to 6 lines broad.

Alkaline clay soil of desert valleys: Colorado and Mohave deserts; Inyo Co. to Lassen and Modoc cos.; east to New Mexico and north to Washington.

Var. *baileyi* Jepson n. comb. Smaller, branchlets always spinescent; bark dark gray; leaves usually pubescent, 4 to 7 lines long.—Mono and Inyo cos.; southern Nevada.

Refs.—*SARCOBATUS VERMICULATUS* Torr. in Emory, Mil. Recon. 150 (1848); Cov. Contrib. U. S. Nat. Herb. 4: 185 (1893); Chesnut and Wilcox, U. S. Dept. Agr. Div. Bot. Bull. 26: 139 (1901). *Batis* (?) *vermiculata* Hook. Fl. Bor. Am. 2: 128 (1838), type loc. Columbia River, Douglas. *Fremontia vermicularis* Torr. & Frem. in Frem. Sec. Rep. 317, pl. 3 (1845). Var. *BAILEYI* Jepson. *S. baileyi* Cov. Proc. Biol. Soc. Wash. 7: 77 (1892), type loc. Nye Co., Nev., Fernon Bailey; Contrib. U. S. Nat. Hb. 4: 184, pl. 20 (1893).

14. *SUAEDA* Forsk. SEA BLITE.

Fleshy plants of salt marshes or alkaline plains. with alternate subterete linear leaves. Flowers perfect, or perfect and pistillate on the same plant, sessile in the axils of the leafy bracts, minutely bracteolate; calyx with 5 lobes,



Fig. 91. *SUAEDA CALIFORNICA* Wats. a, flowering branchlet, x 1; b, flower with stigmas exposed, x 4.

fleshy, enclosing the utricle and mostly carinate or crested. Stamens 5. Styles 2 or 3, short and rather thick. Seed with a dark shining crustaceous testa and a spiral embryo.—About 45 species, all continents. (Name from the Arabic.)

Low shrubs or bushes; calyx not appendaged; stigmas from the concave summit of a short style; lower leaves mostly with an obscure short petiole.

Branchlets rather densely crowded with leaves and flowers; calyx cleft about half way.

1. *S. californica*.

Branchlets with smaller less crowded leaves.

Mostly pubescent or woolly; calyx cleft half way

2. *S. suffrutescens*.

Mostly glabrous and glaucous; calyx parted nearly to base

3. *S. moquini*.

Annuals; calyx transversely appendaged; leaves sessile by a rather broad base

4. *S. depressa*.

1. *S. californica* Wats. (Fig. 91.) Plants decumbent, 3 to 9 feet across, the stems woody at base, succulent above and bearing ascending or erect leafy

branchlets $\frac{1}{2}$ to 1 foot long; leaves spreading or somewhat recurved, broadly linear, acute, 6 lines long; flowering branches rather thick and crowded with leaves and flowers, the leaves much surpassing the flower clusters; flowers large, 2 lines broad, 1 to 3 in the axils, when 3 the central one perfect, the 2 lateral smaller and pistillate; seed jet-black.

Sandy beaches bordering San Francisco Bay. Sept.-Oct. Var. *pubescens* Jepson n. var. Herbage woolly-pubescent.—(*Planta tomentoso-pubescentia*.)—Del Mar (San Diego Co.); north along the coast of Southern California as far as Santa Barbara.

Refs.—*SUAEDA CALIFORNICA* Wats. Proc. Am. Acad. 9: 89 (1874), type loc. salt-marshes, San Francisco Bay; Jepson, Fl. W. Mid. Cal. 182 (1901).

2. *S. suffrutescens* Wats. Stem woody, $1\frac{1}{2}$ to 3 feet high, bearing an irregular crown of straggling branches; herbage clothed with a fine pubescence; leaves linear, 2 to 6 (or 12) lines long, the upper little surpassing the flower clusters; calyx cleft a little over half way; clusters mostly 3 to 9-flowered; flowers small, $\frac{1}{2}$ to 1 line broad.

Alkaline valleys: Colorado and Mohave deserts north to Inyo Co.; east to New Mexico. Mexico.

Locs.—Indio, Parish 8268; Little Chemehuevis Valley, Colorado River, Jepson 5216; Lone Pine, Jepson 5122; Tulare plains acc. Coville; Livermore Pass, Jepson, habitally like the type, but its herbage and flowers glabrous.

Refs.—*SUAEDA SUFFRUTESCENS* Wats. Proc. Am. Acad. 9: 88 (1874), based primarily on *Suaeda fruticosa* var. *multiflora* Torr. Pac. R. Rep. 4^o: 130 (1857), the specimens from west Texas; Cov. Contrib. U. S. Nat. Herb. 4: 184 (1893). *S. torreyana* Jepson, Fl. W. Mid. Cal. 183 (1901).

3. *S. moquini* Greene. ALKALI BLITE. Stems more or less decumbent or irregularly spreading, 2 to 3 feet long; herbage glaucous, glabrous; flowering branches long and slender; leaves linear, 2 to 5 lines long, mostly acute; clusters several-flowered; calyx deeply 5-parted.

Alkaline soil: San Joaquin Valley; Southern California; east to Colorado. Very like the preceding save in habit.

Locs.—Stockton, Jepson; San Bernardino Valley, Parish 4199.

Refs.—*SUAEDA MOQUINI* Greene, Pitt. 1: 264 (1889). *Chenopodium moquini* Torr. Pac. R. Rep. 7^o: 18 (1856), based on *Chenopodium linearis* Torr. Bot. Stansbury, 394 (1852), from west side of Great Salt Lake. *Suaeda torreyana* Wats. Proc. Am. Acad. 9: 88 (1874).

4. *S. depressa* Wats. var. *erecta* Wats. Simple or branched at base, erect, strict, $\frac{1}{2}$ to $1\frac{1}{2}$ feet high, glabrous, often glaucous; leaves $\frac{3}{4}$ to $1\frac{1}{4}$ inches long, acute; flowering branchlets dense, their leaves short, ovate-acuminate; calyx-lobes somewhat unequal, with a conspicuous horizontal wing on back.

Southern California and north through the desert to Modoc Co.; east to the Rocky Mts.

Refs.—*SUAEDA DEPRESSA* Wats. Bot. King, 294 (1871). *Salsola depressa* Pursh, Fl. 197 (1814), type loc. plains of the Missouri, Nuttall. Var. *ERECTA* Wats. Proc. Am. Acad. 9: 90 (1874). *Suaeda erecta* Nelson, Coulter's New Man. Rocky Mts. 169 (1909). *Dondia erecta* Nelson, Bot. Gaz. 34: 364 (1902).

15. SALSOLA L.

Bushy-branching herbs with rigid linear or subulate spinescent leaves. Flowers perfect, solitary, sessile and axillary, each subtended by 3 rigid spinescent organs consisting of a bract and 2 bractlets. Calyx 5-parted, its divisions at length horizontally winged on the back. Stamens 5. Ovary depressed; styles 2. Seed horizontal; embryo coiled into a conic spiral; endosperm none.—All continents, about 40 species. (Diminutive of Latin *salsus*, salty, most of the species of saline habitats.)

1. *S. kali* L. var. *tenuifolia* G. F. W. Mey. RUSSIAN THISTLE. Bushy annual; leaves on the young plant linear, prickle-tipped; branches flowering from

near the base; bracts ovate, shortly acuminate, prickly pointed, the bractlets similar but narrower; calyx divisions converging over mature fruit and forming a sort of beak, the wings irregular in shape and size.

Obnoxious weed, native of Asia, only sparingly established as yet in California. First appeared near Lancaster about 1890, Bakersfield in 1895, Stanislaus Co. in 1903, Antioch in 1900, Salinas Valley in 1910, and Solano Co. in 1911. Now established and troublesome at Ceres. Abundant and highly pernicious in the Dakotas, etc.

Refs.—*SALSOLA KALI* L. Sp. Pl. 222 (1753), type European. Var. *TENUIFOLIA* G. F. W. Mey. Russian Thistle, U. S. Bur. Pl. Ind. Farmer's Bull. 10 (1893) and Div. Bot. Bull. 15 (1894); Univ. Cal. Agr. Exp. Bull. 107 (1895).

AMARANTHACEAE. AMARANTH FAMILY.

Ours coarse herbs with simple entire leaves. Flowers small, usually greenish, inconspicuous, perfect or unisexual, in ours congested in spikes or clusters. Calyx of 3 to 5 sepals, or sometimes only 1, persistent and more or less scarious. Corolla none. Stamens 5, sometimes fewer. Ovary superior, 1-celled, with 2 or 3 stigmas. Fruit a utricle, indehiscent, bursting irregularly or circumscissile. Embryo curved.—About 500 species, all continents but mostly tropical, none in the cold zones.

Bibliog.—Gray, A., Amblogyne (Proc. Am. Acad. 5: 168-170,—1861). Uline and Bray, Synopsis of N. Am. Amarantaceae (Bot. Gaz. 19: 267-272, 313-320,—1894; 20: 155-167, 337-344, 449-453,—1895; 21: 348-356,—1896).

Leaves alternate; utricle mostly dehiscent.....1. *AMARANTHUS*.
Leaves opposite; utricle indehiscent.....2. *CLADOTHRIS*.

1. *AMARANTHUS* L. AMARANTH.

Annual weeds with alternate leaves and small green or sometimes purplish glabrous flowers. Flowers bracteate, disposed in axillary or terminal spikes, or in axillary clusters, usually monoecious or polygamous, rarely dioecious, commonly with staminate and pistillate flowers in same cluster. Seed mostly black and shining.—Species 45, mostly tropical but also in the temperate zones of all continents. (Greek a-, not, and maraino, to fade, the spikes of certain species retaining their color in drying.)

Utricle circumscissile, the top falling away as a lid.

Sepals mostly narrowed upward; flowers monoecious.

Flowers in dense terminal and axillary spikes; sepals 5, mostly unequal.

Spikes stout1. *A. retroflexus*.

Spikes slender2. *A. hybridus*.

Flowers in small axillary clusters of short spikes.

Sepals of same number in staminate and pistillate flowers.

Sepals 3; plant erect, bushy-branched; utricle very rugose...3. *A. gracilis*.

Sepals 5 or 4.

Plant prostrate; utricle a little wrinkled.....4. *A. blitoides*.

Plant with ascending stems; utricle smooth.....5. *A. carneus*.

Sepals of staminate flower mostly 3, of pistillate flower mostly 1.....6. *A. californicus*.

Sepals 5, mostly dilated upward.

Flowers monoecious; pistillate sepals fimbriate.....7. *A. fimbriatus*.

Flowers dioecious; pistillate sepals mostly retuse, mucronate.....8. *A. palmeri*.

Utricle fleshy, indehiscent; sepals 2 or 3; prostrate plant.....9. *A. deflexus*.

1. *A. retroflexus* L. ROUGH PIGWEED. Stoutish, commonly branched from the base, with erect or ascending branches, 1 to 4 feet high; herbage roughish pubescent; leaves rhombic to oblong-ovate, petioled, 1 to 3 inches long; flowers green, densely crowded in spikes; spikes axillary and terminal, erect or slightly spreading, 1 to 4 inches long; bracts lanceolate-subnate, scarious except the green carinate midrib, $1\frac{1}{2}$ to 3 lines long; sepals 5, unequal, oblong-lanceolate, cuspidate, 1 line long or less; utricle wrinkled, surpassed by the sepals.

Very common in orchards, gardens and waste lands. Introduced from tropical America.

Ref.—*AMARANTHUS RETROFLEXUS* L. Sp. Pl. 991 (1753), the type from Pennsylvania, *Kalm*.

2. *A. hybridus* L. GREEN AMARANTH. Stems erect or ascending, 1 to 4 feet high; herbage glabrous or sparingly pubescent; leaves broadly ovate to ovate-lanceolate, 1 to 4 inches long; spikes slender, bristly, paniced, especially at ends of branches; sepals about $\frac{1}{2}$ as long as the subulate-lanceolate bracts, oblong, acute or acuminate; utricle surpassing the calyx, scarcely wrinkled.

Introduced from tropical America, occurring locally through the state.

Locs.—Yreka, *Butler* 543; Bouldin Island (*Zoe*, 4: 216); San Bernardino, *Parish* ("as abundant as *A. retroflexus*"). The var. *HYPOCHONDRIACUS* Jepson n. comb., with purple-tinged leaves, bracts and flowers, is also introduced in the lower Sacramento River islands (*Erythea*, 1: 243).

Refs.—*AMARANTHUS HYBRIDUS* L. Sp. Pl. 990 (1753), the type from Va. *A. chlorostachys* Willd. Hist. Amaranth. 34, t. 10, fig. 19 (1798); *Parish*, *Zoe*, 1: 125 (1890). Var. *HYPOCHONDRIACUS* Jepson. *A. hypochondriacus* L. Sp. Pl. 991 (1753), the type from Va.

3. *A. graecizans* L. TUMBLE-WEED. Stems freely and rigidly branching, 1 to 3 or 4 feet high, commonly of bushy outline; herbage light or somewhat yellowish green, glabrous or nearly so; leaves oblong-spatulate or obovate, $\frac{1}{4}$ to 8 lines long; flowers in clusters in short axillary spikes; bracts subulate, 1 to $1\frac{1}{2}$ lines long, much longer than the sepals; sepals 3, oblong, acute or obtuse, thin, shorter than the rugose utricle.

Summer weed; extremely abundant in cultivated fields; naturalized from tropical America. The plant becomes rigid when dead and dry, and when loosened by fall winds is carried across the fields as a tumble-weed, the seeds being thus most effectively dispersed.

Refs.—*AMARANTHUS GRAECIZANS* L. Sp. Pl. 990 (1753), the type from Va. *A. albus* L. Sp. Pl. ed. 2, 2: 1404 (1763); Jepson, Fl. W. Mid. Cal. 173 (1901).

4. *A. blitoides* Wats. Stems branching, prostrate or spreading and mat-like, $\frac{1}{2}$ to 2 feet long; herbage glabrous or nearly so; leaves spatulate to obovate, $\frac{1}{4}$ to 6 or 10 lines long, often white-nerved on the margins and beneath, drawn down to slender petioles; flowers in axillary clusters mostly shorter than the petioles; bracts ovate-lanceolate, little longer than the sepals; sepals 5 or 4, oblong or oblong-lanceolate, acute or cuspidate, slightly shorter, or 1 or 2 equaling or slightly longer, than the utricle; stamens 3; utricle somewhat wrinkled toward the summit.

Washington to Colorado and south to Mexico. Introduced in California.

Locs.—Rialto and Santa Monica, acc. *Abrams* (Fl. Los Ang. 133); Suisun and Niles, acc. *Greene* (Pitt. 2: 105); Yreka, *Butler*.

Var. *crassius* Jepson n. var. Stems 1 to $1\frac{1}{2}$ feet long, these and the branchlets coarsish, whitish, ascending; leaves not at all or scarcely white-veined.—(Caules pedales vel sesquipedales ramulique crassiusculi subalbi ascendentes; folia haud albo-venosa.)—Reno, Nev., *Jepson* (type); Modoc Co., *Manning* 242.

Refs.—*AMARANTHUS BLITOIDES* Wats. Proc. Am. Acad. 12: 273 (1877), type spms. from Nev. (Bot. Gaz. 19: 315).

5. *A. carneus* Greene. Stems ascending, thickish, obscurely angled or grooved, somewhat flexuous, 1 to $1\frac{1}{2}$ feet long; leaves narrowly obovate, acute, bristly tipped, $\frac{3}{4}$ to 1 inch long, acutely drawn down to a petiole; flowers in axillary clusters of short spikes little exceeding the petioles; axes of the spikes thickish, flexuous; sepals 5, unequal, broadly oblong, acuminate or acute, equaling or the longer ones exceeding the smooth utricle, all more or less cuspidate-tipped; style short and thick, forming a distinct apiculation to the utricle; stigmas 3.

Siskiyou Co. (Yreka, *Butler* 1067). Idaho.

Refs.—*AMARANTHUS CARNEUS* Greene, Pitt. 2: 105 (1890), type loc. Beaver Cañon, Idaho, *Greene*.

6. *A. californicus* Wats. Stems prostrate, 4 to 12 inches long, stoutish and rather fleshy, with numerous short branchlets; leaves obovate to oblong, mostly obtuse, prominently mucronate, the veins and margins white, 2 to 5 lines long, the petiole $\frac{1}{2}$ to as long; flowers green or reddish, in many small axillary clusters; sepals in staminate flower 3 (or 2), membranous, oblong-ovate, mucronate or erosulate; stamens 3 (or 2 or 1); sepals in pistillate flower 1 (or 2 or 3); utricle smooth, bursting irregularly and releasing a red seed.

Moist soils, often in beds of dried-up pools or lakes; California to southern Oregon and western Nevada. Sept.-Oct.

Locs.—Yreka, *Butler* 133; Searsville, San Mateo Co., *C. F. Baker* 1855; Palomar, *McClatchie*.

Refs.—*AMARANTHUS CALIFORNICUS* Wats. Bot. Cal. 2: 42 (1880). *Mengea californica* Moq. in DC. Prodr. 13: 270 (1849), type loc. Monterey, *Hartweg* 1930; “*Caulis *** erectus*”; otherwise the spms. above cited agree notably with description of the type.

A. ALBOMARGINATUS Uline & Bray, Bot. Gaz. 19: 318 (1894), type loc. Monterey Co., *Palmer* 456 in 1876. Stems white; leaves elliptical, very small (1 to 2 lines long), conspicuously white-margined; flowers crowded in the dense foliage; sepals 2 or 3, minute, scale-like.—Not known to us, but apparently the plant we here take to be *A. californicus*.

7. *A. fimbriatus* Wats. Stems several from the base, 1 to 2 feet high, simple or sparingly branched; herbage glabrous, purplish, especially the inflorescence; leaves linear, narrowed below into a short petiole, 1 to 2 inches long; flowers in rather loose clusters; clusters scattered or mostly approximate and forming a long terminal spike; bracts ovate, acute, scarious-bordered, shorter than the calyx; sepals of staminate flowers oblong, obtuse, those of the pistillate flowers broadly fan-shaped with a narrow thickened base and fimbriate margin, 1 line long; “stamens 2 or 3”; stigmas 3.

Mohave and Colorado deserts, east to Utah and Texas, south into Mexico.

Locs.—Lanfair, *Maye Tennent*; Julian, *Cleveland*.

Refs.—*AMARANTHUS FIMBRIATUS* Wats. Bot. Cal. 2: 42 (1880). *Amblogyne fimbriata* Gray, Proc. Am. Acad. 5: 168 (1861). *Sarratia berlandieri* var. *fimbriata* Torr. Bot. Mex. Bound. 179 (1859), type loc. Gila River, *Schott*.

8. *A. palmeri* Wats. Stems stout, erect, 2 to 4 feet high, glabrous or pubescent; leaves broadly ovate, acute or acuminate, broadly cuneate at base, 1 to 4 inches long, on petioles 1 to 2 times as long; flowers dioecious, in dense elongated spikes leafy at base; bracts solitary, those of the pistillate spikes subulate, spreading, rigid, awn-tipped, narrowly scarious-margined at base, 2 to 3 times as long as the flowers; calyx $\frac{3}{4}$ to $1\frac{1}{2}$ lines long, falling with the fruit, unequal, obscurely cordate at base; sepals of staminate flower oblong-ovate and acute, or oblong-lanceolate and acuminate; sepals of pistillate flower obovate, retuse or truncate, usually mucronate or setaceously apiculate; stigmas 2; utricle rugose at summit.

Colorado Desert; east to Texas and south into Mexico.

Locs.—Holtville, *Parish* 8269; Chemehuevis Valley, Colorado River, *Jepson* 5209; Ft. Yuma, *Brandege*; Salton Creek, *Brandege*; Cameron Lake, *Brandege*. Abundant in southern Arizona where, cut and stacked by the Mexican population as a winter feed for horses, it yields nearly 3 tons per acre (*Bur. Pl. Ind. Bull.* 67: 58).

Ref.—*AMARANTHUS PALMERI* Wats. Proc. Am. Acad. 12: 274 (1877), type loc. Larkin's Sta., San Diego Co., *Palmer* 323.

9. *A. deflexus* L. Stems slender, prostrate, a little succulent, 1 to $1\frac{1}{2}$ feet long; leaves rhombic-ovate; flowers polygamous, in short spikes clustered in the axils, or disposed in dense terminal spikes 1 inch long or more; sepals 2 or 3, oblong, surpassing the bracts; utricle 3 to 5-ribbed, surpassing the sepals, indehiscent.

Introduced from southern Europe; naturalized along streets and in gardens; towns about San Francisco Bay.

Ref.—*AMARANTHUS DEFLEXUS* L. Mant. 2: 295 (1771), type European.

2. **CLADOTHRIX** Nutt.

Stellate-pubescent annuals or woody-based perennials with opposite leaves. Flowers axillary, solitary or in small glomerules, perfect, subtended by 3 small bracts and by foliaceous involucre bracts. Sepals 5, equal, thin, pubescent. Stamens 5, arising from the margin of a short cup-shaped hypogynous disk, with 5 short teeth alternating with the filaments. Achene subglobose, indehiscent.—Species 3, southern United States and Mexico. (Greek klados, branch, and thrix, hair, in reference to the stellate covering.)

1. **C. oblongifolia** Wats. White-woolly perennial; stems widely branching, forming low broad mound-like plants 9 to 15 inches high and $1\frac{1}{2}$ to 3 feet broad; leaves roundish ovate, obtuse, 3 to 10 lines long, shortly petioled; involucre bracts united and forming definite involucre; involucre panicleately disposed, subsessile or shortly peduncled, their tubes oblong-turbinate, 1 to $1\frac{1}{2}$ lines long, their lobes 3, foliaceous, round-ovate, 1 to 2 lines long; sepals ovate-lanceolate, 1 line long.

Sandy washes; Colorado Desert and eastern Mohave, north into Inyo Co. Arizona, southern Nevada.

Locs.—Milpitas, Colorado River, *Jepson* 5283; Salton, *Parish*; Bagdad, *T. Brandegee*; Death Valley, acc. *Coville*. Ash Mdws., Nev., *Purpus* 6025.

Refs.—**CLADOTHRIX OBLONGIFOLIA** Wats. *Proc. Am. Acad.* 17: 376 (1882), type spms. from the Colorado River (Chimney Peak, *Newberry*, and Yuma, *Pringle*) and the Mohave Desert, Warm Spgs., *S. B. & W. F. Parish* 1346; *Cov. Contrib. U. S. Nat. Herb.* 4: 179 (1893). *C. cryptantha* Wats. *Proc. Am. Acad.* 26: 125 (1891), based on spms. by *Parry* (e. Colorado Desert) and by *Orcutt* 2186 (Carrizo Creek, San Diego Co.); *Parish, Zoe*, 5: 113 (1901). *C. lanuginosa* Wats. *Bot. Cal.* 2: 43 (1880), not Nutt. With each flower-cluster set in an involucre cup, *C. oblongifolia* is sharply separated from *C. lanuginosa* Nutt., which has solitary flowers and its involucre bracts quite distinct. The latter species occurs in Arizona and may yet be found in southeastern California.

Alternanthera achyrantha R. Br. *Prodr.* 1: 417 (1810). Prostrate annual with opposite leaves; leaves broadly ovate or obovate, shortly acute or mucronate, 5 to 11 lines long, cuneately narrowed at base into a petiole; flowers perfect, in short white spikes; spikes dense, mostly axillary, solitary or clustered, 3 to 6 lines long; sepals 5, lanceolate, unequal, 2 more carinate-concave, all woolly on the back with barb-tipped hairs; stamens 5, with 5 alternating sterile filaments, all united at base into a cup-like disk; achene flattened, indehiscent.—Native of Mexico, locally introduced at Los Angeles (*Erythea*, 1: 99).

NYCTAGINACEAE. FOUR-O'CLOCK FAMILY.

Ours more or less succulent herbs or low shrubs with opposite entire leaves and commonly swollen joints. Flowers perfect, regular, subtended by bracts which often form a calyx-like involucre. Bracts or involucre often colored. Calyx plicate in the bud, tubular, colored like a corolla and very delicate, 4 or 5-lobed, the lower part of its tube circumscissile and leaving a persistent base which is closely constricted over but not attached to the superior ovary. Corolla none. Stamens in ours 3 to 5 (or 7), mostly unequal, hypogynous (or perigynous in *Abronia*). Ovary 1-celled, 1-ovuled; style and stigma 1. Fruit an achene, closely invested by the base of the calyx-tube, which becomes very much hardened and is often striate, ridged, or winged. Embryo mostly coiled, with mealy endosperm; cotyledons 2, or only 1 in *Abronia* by reduction.—Genera 20 and species about 200; all continents but mainly American.

Bibliog.—Gray, A., *Some new Gen. and Sp. of Nyctaginaceae*, prin. coll. in Tex. and New Mex. (*Am. Jour. Sci.* ser. 2, 15: 259-263, 319-324,—1853). Rydberg, P. A., *Nyctaginaceae of Rocky Mt. Reg.* (*Bull. Torr. Club*, 29, 680-693,—1902). Jones, M. E., *Nyctaginaceae of the Great Plateau* (*Contrib.* 10: 34-54,—1902). Standley, P. C., *Allioniaceae of the United States*

(Contrib. U. S. Nat. Herb. 12: 303-389,—1909); Allioniaceae of Mexico and Central America (l. c. 13: 377-430,—1911).

Flowers without an involucre, each pedicel bearing or subtended by 1 to 3 small bracts.

Calyx campanulate or funnelform, mostly reddish or purplish.

Fruit 5-angled or 5-ribbed.....1. BOERHAAVIA.

Fruit globose, smooth.....2. HERMIDIUM.

Calyx salver-shaped with very much elongated tube, white.....3. ACLEISANTHES.

Flowers subtended by an involucre.

Involucral bracts distinct or nearly so; fruit usually winged.

Braets 5 or more, wholly distinct; fruit without glands.....4. ABRONIA.

Braets 3, distinct nearly to base; fruit with 2 rows of glands.....5. WEDELIELLA.

Involucre composed of more or less united bracts; fruit not winged.

Fruit 5-ribbed; involucre enlarged in fruit.....6. ALLIONIA.

Fruit mostly smooth; involucre unchanged in fruit.....7. MIRABILIS.

1. BOERHAAVIA L.

Slender herbs with glandular rings about the internodes. Blades of the opposite leaves unequal. Bracts minute, 1 to 3 to each flower. Flowers small, on jointed pedicels. Calyx campanulate or funnelform, 5-lobed. Stamens 1 to 5; filaments slender, united at base. Stigma shield-shaped. Fruit club-shaped to obpyramidal, 3 to 5 (or 10) -ribbed, or -angled, or narrowly winged.—Species 50, all continents. (H. Boerhaave, 1668-1738, famous Dutch physician and botanist, professor at Leiden.)

Calyx campanulate; fruit 5-ribbed.

Annual; fruit glabrous.....1. *B. intermedia*.

Perennial; fruit glandular-viscid.....2. *B. hirsuta*.

Calyx funnelform; fruit obscurely 10-ribbed.....3. *B. annulata*.

1. *B. intermedia* Jones. Low, spreading or ascending, the stems almost filiform-slender, $\frac{3}{4}$ to $1\frac{1}{4}$ feet long; leaves elliptic to lanceolate, obtuse or acute; peduncles bearing 2 to 5 umbellate or subcapitate flowers; calyx 1 line long; fruit cuneate or short-clavate, 1 to $1\frac{1}{2}$ lines long.

Southwestern Colorado Desert (Orcutt 2090 acc. Standley), east to Texas and south into Mexico.

Refs.—BOERHAAVIA INTERMEDIA Jones, Contrib. 10: 41 (1902), type loc. El Paso, Tex., Jones 4173; Stand. Contrib. U. S. Nat. Herb. 12: 382 (1909).

2. *B. hirsuta* Willd. Stem branching, 2 or 3 feet long, parts or some of the internodes and petioles sparsely hirsute-glandular; leaves round-ovate, mostly obtuse or some acutish, rounded at base, $\frac{1}{2}$ to 2 inches long; flowers nearly sessile in small clusters terminating slender peduncles, the peduncles more or less divaricate in a loose panicle; calyx red, 1 line long; fruit 1 to 2 lines long, 5-ribbed.

Sau Jacinto Valley and Coyote Cañon (Southern California), east to Arizona and Mexico.

Refs.—BOERHAAVIA HIRSUTA Willd. Phyt. 1 (1794); Stand. Contrib. U. S. Nat. Herb. 12: 382 (1909).

3. *B. annulata* Cov. Perennial; stem stout, erect from an ascending base, glabrous, glaucous, 1 to 3 feet high, the middle of each internode usually with a reddish mucilaginous ring; leaves ovate-oblong, cordate or rounded at base, obtusish at apex, thick, rigid, fleshy, entire or sometimes "lacerate," 1 to 2 inches long, hirsute; petiole nearly as long as blade; flowers 3 to 4 lines long, in small clusters terminating the branches; stamens 3, and with the style, conspicuously exserted; fruit turbinate, glabrous, obscurely 10-ribbed, $2\frac{1}{2}$ lines long.

Death Valley region.

Refs.—BOERHAAVIA ANNULATA Cov. Contrib. U. S. Nat. Herb. 4: 177, pl. 18 (1893), type loc. Furnace Creek Cañon, Funeral Mts., Coville 577. *Anulocaulis annulatus* Stand. Contrib. U. S. Nat. Herb. 12: 375 (1909).

2. **HERMIDIUM** Wats.

Perennial glabrous herbs with thick fleshy leaves. Flowers in head-like clusters on the ends of terminal or axillary peduncles; clusters 6 to 8-flowered, each flower subtended by a large ovate leathery bract, the short pedicels adnate to the midveins of the bract. Calyx campanulate-funnelform, light purple, slightly lobed. Stamens 5 to 7, these and the style about as long as the calyx. Fruit nearly globose, smooth, glabrous.—Monotypic. (Diminutive of the Greek Hermes, perhaps a fancied resemblance between the pediceled flower and a little statue of that god.)

1. **H. alipes** Wats. Stems several from a woody caudex, stout, ascending, simple or slightly branched, 5 to 12 inches high; leaves round to oblong-ovate, obtuse or subacute, subcordate at base, 1 to 2 inches long, very shortly petioled; bracts occasionally slightly united.

Panamint and White mountains, north to north-central Nevada, thence east to Utah.

Refs.—**HERMIDIUM ALIPES** Wats. Bot. King, 286, pl. 32 (1871), type loc. Humboldt Valley, Nev., *Watson*.

3. **ACLEISANTHES** Gray.

Perennial herbs or low shrubs. Flowers axillary or terminal, each subtended by 1 to 3 small narrow bracts. Calyx white, with a very much elongated slender tube and spreading but very small 5-lobed limb. Stamens 2 to 5, unequal, the slender filaments united at the base. Fruit narrowly ellipsoidal, 5-angled or 5-ribbed.—Southwestern United States and Mexico, 7 species. (Greek *a-*, privative, *cleis*, something which closes, and *anthos*, flower, the flower not enclosed by the involucre.)

1. **A. longiflora** Gray. YERBA DE LA RABIA. Stems slender, scabrous puberulent, 6 to 10 inches long; leaves triangular-lanceolate, acute, broadly cuneate at base, $\frac{1}{2}$ to 1 inch long, shortly petioled; calyx-tube 4 to $4\frac{1}{2}$ inches long, its lobes 2 or 3 lines long; stamens exserted.

Marie Mts., eastern Riverside Co., *Schellenger*. East to Texas and south into Mexico.

Refs.—**ACLEISANTHES LONGIFLORA** Gray, Am. Jour. Sci. ser. 2, 15: 261 (1853), type loc. Valley of the Limpio, Texas, *Wright* 599; Torr. Bot. Mex. Bound. 170, pl. 46 (1859).

4. **ABRONIA** Juss.

Herbs with viscid herbage. Leaves of the opposite pairs more or less unequal. Peduncles axillary or terminal, bearing a many-flowered head subtended by 5 to 15 distinct involueral bracts. Flowers showy. Calyx salverform. Stamens commonly 5, unequal, included in the tube and inserted upon it. Style included. Persistent base of calyx 3 to 5-winged, more or less reticulate, enclosing a cylindrical achene.—Species about 25, western North America. (Greek *abros*, graceful.)

1. *Caulescent plants.*

Fruits with 2 to 5 conspicuous wings.

Fruits very large and with very thick wings; seacoast.

Flowers yellow 1. *A. latifolia*.

Flowers deep dark red 2. *A. maritima*.

Fruits smaller and with thinner wings; flowers red, pink or white.

Herbage glandular or glandular-puberulent; seacoast.

Wings mostly 5, broadened upward, truncate above or tapering to the beak 3. *A. umbellata*.

Wings mostly 3, wider, produced above into a rounded lobe which surpasses the body 4. *A. alba*.

Herbage villous, usually glandular; mostly of the interior.

Wings usually 5, often unequal 5. *A. villosa*.

Wings only 2 6. *A. pogonantha*.

Fruits narrowly winged or wingless.

- Wings 5, narrow, sometimes ridge-like.....7. *A. turbinata*.
Wings or ridges 2 or none.....8. *A. exalata*.

2. *Acaulescent or nearly so; high montane.*

- Prostrate, forming thick mats; clusters 2 or 3-flowered.....9. *A. alpina*.
Erect, scapose; clusters about 15-flowered.....10. *A. nana*.

1. ***A. latifolia* Esch. YELLOW SAND-VERBENA.** Stems stout, 1 to 2 feet long, prostrate, only the leaves and flowering peduncles ascending or erect; herbage very succulent, glandular-puberulent; leaves orbicular and broader than long to broadly ovate, truncate or reniform at base, $\frac{1}{2}$ to $1\frac{1}{2}$ inches long; peduncles usually exceeding the leaves; bracts 5, broadly ovate, acute, 2 to 3 lines long; flowers somewhat fragrant, yellow, 6 lines long; fruit broadly turbinate, 4 to 7 lines long, its 5 wings more or less unequal, broadened from the base upward, then sloping abruptly to the short beak or truncate, or the wings sometimes much reduced; taproots cylindric, fleshy, $\frac{1}{2}$ to 2 inches thick, 1 to $1\frac{1}{2}$ feet long, often (when large) with rope-like branches several feet long.

Common along the seashore from Santa Barbara Co. to Monterey and northward to Vancouver Island. May-Nov.

Ref.—*ABRONIA LATIFOLIA* Esch. Mem. Acad. Petersb. 10: 281 (1826), type from California (Linnaea, 3: litt. ber. 147).

2. ***A. maritima* Nutt.** Stems prostrate, 1 to 2 feet long; herbage glandular-puberulent; leaves thick, round-ovate, with regular flowing outline, $\frac{1}{2}$ to $\frac{3}{4}$ inches long; flowers deep dark red; bracts thick, long oblong, acute, 4 to 5 lines long; fruit large (5 to 7 lines long, 6 to 10 lines broad), its 5 wings strongly broadened upward, often somewhat produced above the body and equaling or exceeding the short beak, or sometimes one or more much reduced.

Seashore, San Luis Obispo Co. to San Diego. Lower California, Mexico.

Locs.—Avila, San Luis Obispo Bay, *Summers*; San Clemente Isl., *T. Brandegee*; Del Mar, *T. Brandegee*; San Diego, *Jepson* 1596; Coronado, *Berg*. The large globose clusters of fruit suggest vaguely the head of Medusa. The variations in fruit and pubescence would, to a certain degree, afford basis for segregation of forms similar to those of *A. umbellata*.

Ref.—*ABRONIA MARITIMA* Nutt.; Wats. Bot. Cal. 2: 4 (1880), type loc. San Pedro, *Nuttall* (ex. label of type in Gray Herb.).

3. ***A. umbellata* Lam. COMMON SAND-VERBENA.** Stems slender, prostrate, viscid, 1 to 3 feet long; leaves nearly glabrous, roundish or ovate to narrowly oblong, the margin often somewhat sinuate, 1 to $1\frac{1}{2}$ inches long; heads 10 to 15-flowered, on peduncles 2 to 6 inches long; involueral bracts narrowly lanceolate, 2 or 3 lines long; calyx rose-purple, 6 to 8 lines long; fruit 4 to 5 lines long, often as broad; wings mostly 5, rather thin but firm, widened upward and broadest above, at apex truncate or sloping to the beak, usually shorter than the beak, or the wings sometimes reduced and the fruit narrow and spindle-like.

Common, Californian seacoast from Los Angeles Co. to Monterey, San Francisco Bay, Humboldt Co. and north to Washington.

Refs.—*ABRONIA UMBELLATA* Lam. Tab. Encycl. 1: 469, pl. 105 (1791), the type spm. cult. at Paris from seed coll. at Monterey by Collignon of the La Perouse Exped. (*Jussieu*, Gen. 449); *Jepson*, *Erythra*, 1: 189 (1893). *Lamarck's* illustration shows a cluster of somewhat spindle-shaped 5-winged fruits. This is the earliest described new species from California. *A. insularis* Stand. Contrib. U. S. Nat. Herb. 12: 311, pl. 28 (1909), type loc. San Clemente Island, *Trask*; differs from *A. umbellata* in its glabrous stems, elongated internodes and thick coriaceous fruit wings, ex. char.; not seen by us.

Plants are sometimes found with very narrowly winged or ridged fruits, the wing broadest near the middle and tapering to both base and apex (Seaside, Monterey Co., *K. Brandegee*), or again with small flowers about 5 lines long (Eureka, *Tracy* 2550). Plants enjoying both the above characters answer to *A. breviflora* Stand. Contrib. U. S. Nat. Herb. 12: 312, pl. 30

(1909), type loc. Mendocino, *Brown* 833. *A. neurophylla* Stand. l. c. 314, pl. 32, type loc. San Nicolas Island, *Trask* 23, is a larger, stouter plant than *A. umbellata* with thicker fleshy leaves and thicker bracts, ex. char.; fruit unknown.

4. *A. alba* Eastw. Similar to *A. umbellata*; leaves orbicular to elliptical or oblong, often wavy-sinuate; bracts narrowly ovate, acuminate; flowers white; fruit glabrous or nearly so, its body smaller and whiter than in *A. umbellata*, its wings thin but firm, broader below than in that species and somewhat prolonged above the body as rounded lobes.

San Nicolas Island. On the mainland represented by varieties which are scarcely separable from the species; the first variety evidently passes into *A. umbellata* on the Santa Barbara coast.

Var. *platyphylla* Jepson n. comb. Leaves mostly rather broad, wavy-sinuate; flowers pinkish or reddish; fruit wings chartaceous.—Seacoast, San Diego to San Luis Obispo Co.; and perhaps north to Monterey. Var. *variabilis* Jepson n. comb. Internodes elongated; leaves few, small, irregularly rhomboidal to oblong; flowers as in preceding; wings membranous.—San Diego to San Luis Obispo Co.

Refs.—*ABRONIA ALBA* Eastw. Proc. Cal. Acad. ser. 3, 1: 97 (1898), type loc. San Nicolas Island, *Blanche Trask*. Var. *PLATYPHYLLA* Jepson. *A. platyphylla* Stand. Contrib. U. S. Nat. Herb. 12: 314, pl. 33 (1909), type loc. Del Mar, San Diego Co., *T. Brandegee*. Var. *VARIABILIS* Jepson. *A. variabilis* Stand. l. c. 314, pl. 31, fig. 1, type loc. Redondo, *Braunton* 258. *A. minor* Stand. l. c. 313, pl. 29, fig. 2, type loc. McGinnis, n. San Luis Obispo Co., *Palmer* 521; wings thin and soft, those of the outer fruits very narrow, widest in the middle and narrowed above and below; not seen by us, but ex. char., seems near var. *variabilis*.

5. *A. villosa* Wats. Stems trailing, $\frac{1}{2}$ to 1 foot long; herbage glandular-villous or the blades subglabrous; leaves ovate to elliptic, a little wavy-margined, $\frac{1}{2}$ to $1\frac{1}{4}$ inches long; bracts narrowly lanceolate, acuminate, 3 to 5 lines long, scarious; flowers rose-purple, 5 to 8 lines long; fruit 3 lines long and 4 or 5 lines broad, 5-winged, the thin wings obliquely widened upward and forming broad diverging lobes more or less auriculate produced beyond the body; body reticulate-honeycombed; beak slender, often prominent.

Southern California, east to Arizona and Utah.

Locs.—San Luis Obispo, acc. *Standley*; Ash Hill, Mohave Desert, *Hall* 6101; Barstow, *K. Brandegee* (wings submembranous); Kramer, *K. Brandegee* (the specimens show wingless fruits on same plants with the usual winged fruits); San Felipe, Colorado Desert, *Stephens*; Anaheim, acc. *Standley*; Carrizo Creek, *T. Brandegee*.

Var. *aurita* Jepson n. comb. Body less reticulate or scarcely at all so; flowers 8 to 13 lines long; does not seem to differ essentially otherwise.—San Jacinto, *Jepson* 1245; San Felipe, *T. Brandegee*; Calexico, acc. *Parish* in herb.

Refs.—*ABRONIA VILLOSA* Wats. Am. Nat. 7: 302 (1873), type from Ariz., *Wheeler*. Var. *AURITA* Jepson. *A. aurita* Abrams. Bull. Torr. Club. 32: 537 (1905), type loc. Palm Sprs., *Parish* 4138. *A. pinetorum* Abrams. Bull. Torr. Club. 32: 537 (1905), type loc. Thomas Valley, San Jacinto Mts., *Hall* 2166; leaves smaller; fruit pink; otherwise essentially like var. *aurita*.

6. *A. pogonantha* Heimerl. Stems trailing, 10 to 12 inches long; herbage glandular short-villous or the blades nearly glabrous; leaves ovate or broadly oblong to oblong-lanceolate, 1 to 2 inches long; bracts ovate, acute or acuminate, 3 lines long; calyx pale or lavender white, or purple, 8 lines long; fruit commonly 2-winged, rarely with a third smaller wing, round-obcordate with a somewhat squarish notch at summit, 2 to 3 lines long and as broad, the body and wings reticulate.

Mohave Desert, north to the San Carlos Range and to Inyo Co.

Locs.—San Carlos Creek, *Jepson* 2738; Kramer, *Jepson* 5332; Lancaster, *K. Brandegee*; Antelope Valley, *Davy* 2214; Olancho, *Hall & Chandler* 7348.

Refs.—*ABRONIA POGONANTHA* Heimerl, Engler, Bot. Jahrb. 11: 87, pl. 2, fig. 4 (1889), type loc. Hesperia, *Parish* 1345. *A. angulata* Jones, Contrib. 8: 39 (1898), type loc. Darwin Mesa, Argus Mts., *Jones*.

7. *A. turbinata* Torr. Annual; stems ascending or suberect, puberulent; leaves round-ovate to elliptical, glabrous, bright green, $\frac{1}{2}$ to $1\frac{1}{2}$ inches long;

bracts lanceolate, acute; flowers whitish or pinkish, 8 or 9 lines long; fruit $2\frac{1}{2}$ to 3 lines long, narrowly obpyramidal, its much wrinkled wings gradually narrowed upwards and truncate at summit.

Death Valley region; north into Nevada and Oregon, east to New Mexico.

Locs.—Deep Spring Valley, *Purpus* 5822; Bishop, *Heller* 8346.

Ref.—*ABRONIA TURBINATA* Torr.; Wats. Bot. King, 285, pl. 31 (1871), type loc. Hot Spring Butte, Humboldt Co., Nev., *Watson*.

8. *A. exalata* Stand. Very similar to *A. turbinata* and perhaps only a mere form of it; leaves ovate to roundish, truncate at base, $\frac{1}{2}$ to 1 inch long; flowers 5 lines long; fruit 2 lines long, with mostly 2 ridges or narrow wings on one side, these ridges incurved and forming a sort of half-closed concavity; beak prominent for the size of the fruit.

Southern Sierra Nevada, eastward to Nevada.

Locs.—Kern River, acc. *Standley*; Owens Lake, *Jepson* 5126.

Ref.—*ABRONIA EXALATA* Stand. Contrib. U. S. Nat. Herb. 12: 318, pl. 36 (1909), type loc. Keeler, Inyo Co., *Coville & Funston* 845.

9. *A. alpina* Brandegee. Stems from perennial roots shortly branched, forming dense mats, 3 to 6 inches across; herbage glandular but blades mostly glabrous; leaves orbicular to round-ovate, 2 to 3 lines long, the petioles 1 to 3 times as long; involucre 3 to 5-flowered, on peduncles 2 to 3 lines long; flowers pink or white, 5 or 6 lines long, the limb 3 to 4 lines broad; fruit $1\frac{1}{2}$ to 2 lines long, narrowed to both ends, 5-angled but not winged.

High sandy meadows, 8000 to 9000 feet, southern Sierra Nevada from near Mt. Whitney to Olancha Peak.

Locs.—Ramshaw Mdws., near Kern Peak, *Mary Haskell, Jepson* 4953; meadows about Templeton Mt., *Jepson* 4971. Plants very handsome, flowering profusely and forming a beautiful lavender-pink fringe on the white sands bordering the meadows in this region.

Ref.—*ABRONIA ALPINA* Brandegee, Bot. Gaz. 27: 456 (1899), type locs. Monachee Mdws. and at Mt. Templeton, *Purpus* 1877, 1497.

10. *A. nana* Wats. Peduncles 3 or 4 inches high, erect, scape-like, arising from a dense tuft of leaves crowning the shortly-branched caudex of a perennial root; herbage glandular-puberulent or the blades nearly glabrous; leaves ovate to oblong, 4 to 10 lines long, mostly long-petioled; involucre about 13 to 20-flowered; bracts ovate to oblong-lanceolate; flowers 6 lines long; fruit obovate in outline, the wings membranous.

Desert ranges, 6000 to 9000 feet, Mohave Desert east to Arizona and Utah.

Loc.—Rose Mine, San Bernardino Mts., *Parish* 3046.

Refs.—*ABRONIA NANA* Wats. Proc. Am. Acad. 14: 294 (1879), type loc. Beaver City, Utah, *Palmer* 404 $\frac{1}{2}$. *A. covillei* Heimerl, Smithsonian. Misc. Coll. 52: 197 (1908), type loc. Inyo Mts., *Coville & Funston* 1782; Stand. Contrib. U. S. Nat. Herb. 12: 316, pl. 34 (1909); "differs from *A. nana* in its very minute pubescence which is not glandular and its ovate leaves, in having lanceolate bracts which are not scarious and are smaller than in that species, and in its smaller flowers"; fruit unknown.

5. *WEDELIELLA* Cockerell.

Prostrate herbs, ours perennial. Leaves of the opposite pairs very unequal. Flowers reddish or white, 3 in each involucre. Involucres 3-flowered, solitary on axillary peduncles, deeply divided into 3 sepal-like bracts. Calyx with a short oblique tube and 4 unequal lobes. Fruit leathery, smooth and somewhat carinate on the convex side, the opposite side furnished with 2 low parallel thin ridges, each bearing a row of stipitate glands and covered by the inflexed toothed margins of the lateral wings.—One or two variable species. (Diminutive of *Wedelia*, Loeffling's name for this genus, which is doubtless derived from a personal name.)

1. *W. incarnata* Cockerell. Stems slender, 1 to $2\frac{1}{2}$ feet long; herbage pubescent; leaves ovate, acute, the veins prominent on the under side, $\frac{1}{2}$ to

1 $\frac{3}{8}$ inches long, shortly petioled; flowers white to rose-color, 3 to 4 lines long; fruit 2 lines long, its inflexed margin 2 or 3-toothed.

Cañons on the western border of the Colorado Desert. East to Utah and Texas, south to Chile.

Var. *VILLOSA* Cockerell. Stems villous pubescent.—Providence Mts., *T. Brandege*. Var. *NUDATA* Cockerell. Upper internodes long and upper leaves somewhat reduced.—Palm Cañon, *Hall* 1872; Coachella, *Hall* 5808; Chuckawalla Wash, *Schellenger* 101; Ash Hill, Mohave Desert, *Hall* 6102.

Refs.—*WEDELIELLA INCARNATA* Cockerell, *Torreya*, 9: 167 (1909). *Wedelia incarnata* Kuntze, *Rev. Gen. Pl.* 533 (1891). *Allionia incarnata* L. Syst. ed. 10, 890 (1759), type loc. Cumana, Venezuela. Var. *VILLOSA* Cockerell, l. c. *Wedelia incarnata* subsp. *villosa* Stand. Contrib. U. S. Nat. Herb. 12: 333 (1909), type from Ariz., *Pringle*. Var. *NUDATA* Cockerell, l. c. *Wedelia incarnata* subsp. *nudata* Stand. l. c., 334, type loc. Coyote Cañon, *Hall* 1872.

6. *ALLIONIA* Loeß. UMBRELLA-WORT.

Perennial herbs. Leaves slightly fleshy. Involucres 5-lobed, in fruit enlarged and membranous or reticulate-veined, 1 to 5-flowered. Flowers red to purplish or white. Calyx campanulate or funnelform. Stamens 3 to 5, unequal; filaments united at base. Fruit clavate, 5-angled or 5-ribbed.—Species about 60, southwestern United States to Chile. (Chas. Allioni, 1725-1804, Italian botanist.)

1. *A. brandegei* Stand. Stems erect or spreading, 4 to 7 inches high, from a thick woody root; herbage viscid pubescent or nearly glabrous; leaves broadly lanceolate, $\frac{3}{4}$ to $1\frac{1}{2}$ inches long, shortly petioled; involucres one to an axil, shortly peduncled; flowers unknown; fruit with 4 or 5 low more or less tuberculate ribs, 3 lines long, pubescent.

Eastern Mohave Desert to southern Nevada.

Ref.—*ALLIONIA BRANDEGEI* Stand. Contrib. U. S. Nat. Herb. 12: 346 (1909), type loc. Providence Mts., *T. Brandege*.

7. *MIRABILIS* L.

Perennial herbs. Flowers 1 to several in a 5-lobed calyx-like involucre. Involucres mostly campanulate, axillary or terminal, borne on short peduncles and in clusters or solitary. Calyx campanulate to funnelform, white or red. Stamens usually 5. Fruit narrowly ellipsoidal to globose, not angled or ribbed, or rarely so, mostly smooth, glabrous. (Latin *mirabilis*, wonderful.) Flowers several in an involucre; calyx funnelform; stamens united at base.—Subgenus *QUAMOCLIDION*.

Fruit 5-angled, tuberculate.....1. *M. greenei*.

Fruit not angled, 10-striate, not tuberculate.....2. *M. froebellii*.

Flowers solitary in each involucre; calyx campanulate; stamens distinct; fruit smooth.—Subgenus *HESPERONIA*.

Involucral lobes linear or lanceolate, 1 to 2 times as long as tube.....3. *M. tenuiloba*.

Involucral lobes short-ovate to short-lanceolate, $\frac{1}{2}$ to as long as tube....4. *M. californica*.

1. *M. greenei* Wats. Stems several from a perennial root, once or twice forked, 1 to 2 feet high; herbage minutely glandular-puberulent; leaves ovate, acute, $1\frac{1}{2}$ to $2\frac{1}{2}$ inches long, shortly petioled; involucres 7 to 10-flowered, 1 to $1\frac{1}{4}$ inches high, campanulate, shortly lobed, the lobes broad, acute at apex; calyx greenish purple, tubular-funnelform, $1\frac{1}{2}$ inches long; fruit "5-angled," longitudinally ridged, more or less tuberculate.

Northern California: Tehama Co. north to Siskiyou Co. May.

Locs.—Hornbrook, *Howell* 1386; Yreka, *Butler* 774; Shasta Valley, *Butler* 1334; Cold Fork, Yollo Bolly foothills, *Jepson*.

Refs.—*MIRABILIS GREENEI* Wats. Proc. Am. Acad. 12: 253 (1877), type loc. Yreka, *Greene*. *Quamoclidion greenei* Stand. Contrib. U. S. Nat. Herb. 12: 358 (1909).

2. *M. froebellii* Greene. Stems stout, many from a perennial root, forking and diffusely spreading and so forming circular plants 1 to 3 feet broad; herbage glandular-pubescent; leaves broadly ovate, $1\frac{1}{4}$ to 4 inches long, often broader than long, subcordate at base, acutish or obtuse at apex; petioles

short; involucre 5 or 6-flowered, campanulate, 8 to 10 lines long, cleft nearly half way into acute lobes; calyx bright or pale purple, funnelform, $1\frac{1}{2}$ to $1\frac{3}{4}$ inches long, the limb 1 to $1\frac{1}{2}$ inches across; fruit light brown, marked by 10 vertical lines of a darker color, not tuberculate.

Kern Co. and Argus Mts. south to San Diego Co. May-June. Very handsome when in full flower in the desert washes, single plants often forming masses of rose-color the size of a wagonwheel.

Locs.—Cottonwood Creek, Inyo Co., *Purpus* 3024; New York Mts., *Jepson* 5446; Bakersfield, *Davy* 1889 ("opens at 6 pm"); Caliente, *K. Brandegee*; Antelope Valley, *Hall* 6259; Palm Cañon, *Jepson* 1376. The following are glabrous or nearly so (var. *glabratum* *Jepson* n. comb.): Vandeventer Flat, San Jacinto Mts., *Hall* 2162; San Felipe, *Brandegee*.

Refs.—*MIRABILIS FROEBELLII* Greene, *Bull. Cal. Acad.* 1: 124 (1885). *Oxybaphus froebellii* Behr, *Proc. Cal. Acad.* 1: 69 (1855), type loc. Warner's Ranch, San Diego Co., *Froebel*. *Mirabilis multiflora* var. *pubescens* *Wats.* *Bot. Cal.* 2: 2 (1880). *Quamoclidion froebellii* *Stand.* *Contrib. U. S. Nat. Herb.* 12: 359 (1909). Var. *GLABRATUM* *Jepson*. *Q. froebellii* subsp. *glabratum* *Stand.* l. c., 360, type loc. Providence Mts., *T. Brandegee*.

3. *M. tenuiloba* *Wats.* Stems branching, woody at base, 1 to $1\frac{1}{2}$ feet high; herbage short pilose and glandular; leaves ovate, acute, truncate or subcordate at base, 1 to 2 inches long, sometimes broader than long, shortly petioled; involucre subcylindric, 4 to 6 lines long, cleft to the middle or below into lanceolate or linear lobes; calyx white, hairy; fruit broadly ovoid, smooth, brown.

Colorado Desert and its western borders. Lower California.

Locs.—West Cañon, *Parish* 6072; Signal Mt., *T. Brandegee*; Coyote Sprs. and Mountain Wells, acc. *Standley*.

Refs.—*MIRABILIS TENUILOBA* *Wats.* *Proc. Am. Acad.* 17: 375 (1882), type loc. western edge of the Colorado Desert, *Wright*.

4. *M. californica* *Gray*. WISHBONE BUSH. Stems erect or ascending, many from the base, repeatedly forked, woody below, forming a bush 1 to $1\frac{1}{2}$ feet high; herbage roughish puberulent to almost glabrous, the inflorescence glandular-pubescent; leaves ovate, mostly acute, subcordate or rounded at base, $\frac{1}{2}$ to 1 inch long, shortly petioled; involucre 2 to 3 lines long, in terminal clusters or solitary in the axils, each involucre on a short peduncle; involucral lobes oblong-ovate, obtuse or acute, equaling or a little exceeding the tube; calyx rose-color or reddish, 4 to 6 lines long, narrowly campanulate, its spreading lobes deeply cleft into 2 somewhat diverging segments; fruit ellipsoidal, sometimes obscurely striate longitudinally, often lineate-mottled transversely, $1\frac{1}{2}$ to 2 lines long.

Coast region from the Santa Lucia Mts. south to San Diego Co. Fl. Jan.-June. Variable in pubescence and apparently in shape and marking of fruits. Flowers open from middle of afternoon until next morning.

Locs.—San Diego, *T. Brandegee*; Del Mar, *Jepson* 1605; Playa del Rey, *Abrams* 2504; Santa Monica, *J. Q. Adams*; Santa Catalina Island, *Trask*, with peculiar flowers (*Erythraea*, 7: 141); Santa Cruz Island, *T. Brandegee*; San Bernardino Valley, *Parish*, *Jepson* 5543; Saugus, *Davy*; San Luis Obispo Co., *Summers*.

Var. *glutinosa* *Jepson* n. comb. Herbage short-villous and glandular; leaves round-ovate, obtuse or acute, sometimes almost reniform; calyx white.—Colorado and Mohave deserts north to Inyo Co. Nevada.

Locs.—Red Hill, Bishop, *Heller* 8248; Pampa Sta., Kern Co., *Heller* 7644; Palm Cañon, *Jepson* 1390; San Felipe Creek below Banner, *T. Brandegee*.

Var. *retrorsa* *Jepson* n. comb. Herbage bright green, minutely and retrorsely scabrous, often sparingly so, especially on the stems; calyx white.—Mohave Desert, north to Washoe Co., Nevada.

Locs.—Barstow, *Jepson* 5371, 5375; Victor, *Hall* 6206.

Var. *aspera* *Jepson* n. comb. Herbage retrorsely pubescent or sometimes villous; leaves broadly ovate, obtuse or acute, subcordate at base, shortly petioled; calyx purplish red; fruit subglobose, brown, longitudinally 10-striate, the striae of lighter color.—Dry hills, Mohave Desert.

Refs.—*MIRABILIS CALIFORNICA* Gray in Torr. Bot. Mex. Bound. 169, 173, pl. 48 (1859), type loc. San Diego, Parry, Thurber. *Oxybaphus glabrifolius* var. *crassifolius* Choisy in DC. Prodr. 13²: 431 (1849), the type a Douglas plant from California, that is probably near Santa Barbara. Var. *GLUTINOSA* Jepson. *M. glutinosa* Nelson, Proc. Biol. Soc. Wash. 17: 92 (1904), type loc. Karshaw, Meadow Valley Wash, Nev., Gooding. *Hesperonia glutinosa* subsp. *gracilis* Stand. Contrib. U. S. Nat. Herb. 12: 365 (1909), type loc. Sabino Cañon, Ariz., Toumey 471c. Var. *RETROSA* Jepson. *Mirabilis retrorsa* Heller, Muhl. 2: 193 (1906), type loc. Southern Belle Mine, Mono Co., Heller 8336. Var. *ASPERA* Jepson. *M. aspera* Greene, Erythea, 4: 67 (1896), type loc. Hesperia, Parish 3757, June 14, 1895.

M. LAEVIS Curran, Proc. Cal. Acad. ser. 2, 1: 235 (1888). *Oxybaphus laevis* Benth. Bot. Sulph. 44 (1844), type loc. Magdalena Bay. We have not seen the type but in a specimen from the type locality (*Lung* 28), which is essentially glabrous as described for the original, the very slightly unequal involueral lobes are narrower and more acuminate than in *M. californica* but no more unequal in size than in some specimens of the latter species which is, furthermore, often nearly glabrous. The two forms, *M. laevis* and *M. californica*, are probably identical, an opinion long ago expressed in the Proceedings of the California Academy, l. c.

M. CEDROSENSIS Jepson n. comb. (*Hesperonia cedrosensis* Stand. Contrib. U. S. Nat. Herb. 12: 362 (1909), type loc. Cedros Island, *T. Brandege*). Stems rather slender, these and the leaves retrorsely scabrate; leaves thickish; fruit subglobose, not conspicuously striate longitudinally. Seems no more than a form of *M. californica*. Attributed doubtfully to San Clemente Island by Standley, l. c.

BATIDACEAE. BATIS FAMILY.

Low maritime bush or woody plant with opposite entire fleshy leaves. Flowers dioecious, crowded in catkins. Catkins sessile, axillary, disposed in terminal spikes. Staminate flower with a 2-lobed calyx, 4 stamens and 4 alternating petal-like staminodia. Pistillate flower without calyx or corolla, consisting of a 4-celled ovary with one ovule in each cell, and a sessile capitate stigma. Seed without endosperm; embryo slightly curved.—One genus.

1. BATIS P. Br.

Species 2 or 3, tropical shores. (Greek batis, the ancient name of some sea-shore plant.)

1. *B. maritima* L. Stems erect or ascending from a woody perennial base, $\frac{1}{2}$ to 1 (or 3) feet high; leaves linear-oblongate, $\frac{1}{2}$ to $1\frac{1}{4}$ inches long; staminate catkins 2 to 4 lines long, their bracts roundish, obtuse, 1 line long, or sometimes broader than long, disposed in 4 vertical rows, persistent; calyx splitting transversely across the top so as to make an anterior and a posterior lobe, about $\frac{3}{4}$ line long; staminodia white, nearly as long, with a roundish or triangular-hastate, somewhat cucullate appendage nearly equaling the slender filament; pistillate catkins 1 or 2 lines long, their bracts round-ovate, acute, deciduous; ovaries coherent, in fruit forming a fleshy spikelet 4 to 6 lines long.

Seashores: Southern and Lower California. Hawaiian Islands. East coast of America from Florida to Brazil.

Locs.—San Pedro, *McClatchie*; Newport, *Davidson*; San Diego, acc. Bot. Cal.

Refs.—*BATIS MARITIMA* L. Syst. ed. 10, 1380 (1759), type loc. Jamaica; Dammer in Engler & Prantl. Nat. Pflzfam. 3^{1a}: 119. fig. 71 (1893). *B. californica* Torr. Smithsonian Contrib. 6: 8, t. 11 (1853). Some authors regard the staminodial structures as petals.

Phytolaccaceae. *PHYTOLACCA DECANDRA* L. Sp. Pl. ed. 2, 631 (1762). Poke-weed. Tall perennial herb with reddish purple stems, alternate entire thin petioled leaves and flowers in racemes; sepals 5, petal-like, white, rounded, $2\frac{1}{2}$ lines long; stamens 5 to 30; ovary lobed, several-celled, the styles as many as the cells; fruit a dark crimson or purple berry which is poisonous.—Lake Co., *Jepson*; Siskiyou Co. (*Zoe*, 4:158). Introduced from the eastern United States.

AIZOACEAE. CARPET-WEED FAMILY.

Ours prostrate or decumbent herbs. Flowers perfect and regular, either solitary or clustered. Calyx 4 or 5-lobed or -parted, either free from or more or less adnate to the ovary. Stamens hypogynous or commonly perigynous, fewer than the sepals or more numerous. Fruit a loculicidal or circumscissile capsule or indehiscent.—Species 450 in 18 genera, mostly African but occurring in all continents. Plants of widely divergent aspect and flower structure.

Calyx free from the ovary; petals none; leaves opposite.

Capsule loculicidal, 3-valved; sepals 5; ovary 3-celled.

Stamens 3 to 5; herbage glabrous.....1. MOLLUGO.

Stamens 5 to 10; herbage soft-pubescent.....2. GLINUS.

Capsule circumscissile; calyx 5-cleft.

Stipules scarious, laciniate; ovary 1-celled; stamens 1 to 3.....3. CYPSELEA.

Stipules none; ovary 2 to 5-celled; stamens numerous.....4. SESUVIUM.

Calyx-tube adnate to the ovary, the flattish summit of the latter free.

Petals none; leaves alternate, plane; fruit indehiscent.....5. TETRAGONIA.

Petals numerous; leaves opposite, 3-sided and very fleshy; fruit dehiscent.....6. MESEMBRYANTHEMUM.

1. MOLLUGO L. CARPET-WEED.

Low glabrous much-branched annuals with whorled leaves and obsolete stipules. Flowers axillary, on slender pedicels. Sepals 5, scarious-margined, white within, thus resembling petals when expanded, persistent. Petals none. Stamens 5, hypogynous and alternate with the sepals, or 3 and alternate with the cells of the ovary. Stigmas 3. Capsule 3-celled, 3-valved, loculicidally dehiscent, the partitions breaking away from the many-seeded axis.—All continents, chiefly Old World tropics, 13 species. (Ancient Latin name for some soft plant.)

1. **M. verticillata** L. INDIAN THICKWEED. Stems prostrate, slender, many from the base, 3 to 7 inches long, forming patches, not fleshy; leaves 5 or 6 in a whorl, unequal, oblanceolate, or spatulate, entire, 4 to 8 lines long; flowers several at each node; sepals oblong, 1 line long; capsule ovoid, scarcely exerted from the calyx; seeds reniform, shining, nearly smooth, obviously striate, crowded in the capsule and irregularly distending its half-transparent walls, which are thus roughened.

Native of the Old World tropics; introduced into California by way of Mexico; sparingly naturalized.

Locs.—Eagle Creek Cañon, Modoc Co., Brewer in 1862; Stillwater (Shasta Co.), M. S. Baker in 1898; Princeton, Chandler in 1905; Healdsburg, Alice King in 1897; Russian River, Davy in 1896; Visalia acc. Coville; Los Angeles, Davidson in 1893.

Ref.—MOLLUGO VERTICILLATA L. Sp. Pl. 89 (1753), "Africa, Virginia."

2. GLINUS L.

Annual herbs with whorled petioled leaves; very near Mollugo. Flowers pedicelled in dense glomerules in the upper axils. Stamens 5 to 10 or 20. Seeds with a strophiole, the funiculus very long and slender.—Species about 5, tropics and subtropics. (Greek name of Theophrastus for a maple, application to this genus unknown.)

1. **G. lotoides** Loeffl. Diffusely branched from the base, the stems 4 to 8 inches long, procumbent or ascending; leaves orbicular to obovate, rounded at apex or abruptly acute, 3 to 6 lines long, at base narrowed to a slender petiole; flowers 2 lines long; stamens 5; seeds blackish, granulated.

Introduced into California from Europe, but only slightly established.

Locs.—Lathrop, K. Brandegee; Chico, Parry; Lakeport (Zoe, 4: 153).

Ref.—GLINUS LOTOIDES Loeffl. Iter Hispan. 145 (1758), type loc. Spain.

3. CYPSELEA Turp.

Inconspicuous prostrate annual. Leaves opposite, those of each pair unequal, and with scarious laciniate stipules. Tube of calyx short, campanulate,

the lobes (in ours) 5, ovate, unequal. Petals none. Stamens 1 to 3. Ovary superior, 1-celled; style 2-cleft. Fruit a subglobose circumscissile capsule. Seeds minute, smoothish, the funiculi persistent on the central placenta.—Species 1, West Indies. (Greek kupsele, a beehive, which the capsule is thought to resemble.)

1. **C. humifusa** Turp. Stems much branched and matted, the plants 1 or 2 inches broad; leaves oblong or elliptical, obtuse, 2 to 6 lines long, the petioles slender, nearly as long; stamens 3, rarely 1, inserted opposite the sinuses.

Immigrant from the West Indies, occurring sparingly in low lands and rarely seen.

Locs.—Lower San Joaquin River, *Congdon*; Aptos, *Parry*. Aug.

Ref.—CYPSELEA HUMIFUSA Turp. Ann. Mus. Par. 7: 219, t. 12, fig. 5 (1806), type loc. San Domingo.

4. SESUVIUM L.

Fleshy decumbent or prostrate herbs with opposite leaves and no stipules. Flowers solitary in the axils, sessile or shortly pediceled. Calyx-tube turbinate, the lobes 5, rose-pink inside, oblong, obtuse. Petals none. Stamens (in ours) numerous, inserted on the calyx. Ovary 2 to 5-celled, with as many separate styles. Capsule membranous, the upper part falling off as a lid. Seeds smooth. Embryo annular.—Species 5, chiefly tropical and subtropical coasts. (Latin Sesuvium, the country of the Sesuvii, a Gallic tribe mentioned by Caesar, the application to this genus unknown.)

1. **S. sessile** Pers. LOWLAND PURSLANE. Stems prostrate, freely branching, 1 to 3 feet long; herbage finely warty; leaves broadly spatulate, $\frac{1}{2}$ to 2 inches long; flowers 4 to 5 lines long; sepals ovate-lanceolate, commonly acuminate, 3 lines long; ovary 2 or 3-celled, styles 2 or 3.

River lowlands and alkaline fields in the San Joaquin Valley and southward to Southern California. East to Kansas and south to Mexico. Brazil. May-Aug.

Locs.—San Joaquin Co., *Jepson*; Knights Ferry, *Sanford*; Palo Verde Valley, *Jepson* 5271; Blue Lake, Imperial Co., *Abrams* 3194; Ramona, *T. Brandegee*; Bakersfield, *Davy* 1771; Owens Lake, *Jepson* 5095; Bagdad, *T. Brandegee*; Nigger Slough, Los Angeles, *Braunton* 574.

Refs.—SESUVIUM SESSILE Pers. Syn. 2: 39 (1807). *S. portulacastrum* Brew. & Wats. Bot. Cal. 1: 251 (1876).

5. TETRAGONIA L. SEA SPINACH.

Ours a succulent annual with alternate plane leaves. Flowers axillary, greenish, apetalous. Calyx 4-lobed, its tube adnate to the 3 to 9-celled ovary. Stamens 1 to many, perigynous. Fruit a hard or bony nut, indehiscent, enveloped by the calyx which bears several horn-like protuberances.—About 25 species, nearly all southern hemisphere and chiefly South Africa. (Greek tetra, 4, and gonu, knee or angle, alluding to the fruit.)

1. **T. expansa** Murr. NEW ZEALAND SPINACH. Branches procumbent or prostrate; leaves rhombic-ovate, entire, 1 to $2\frac{1}{2}$ inches long, abruptly contracted at base to a broad petiole, the surface covered with crystalline papillae; flowers subsessile, 1 to 3 in each axil; calyx-lobes widely spreading, yellowish within; fruit 4-horned, 4 to 6 lines long.

Native of Australasia, cultivated in California for use as summer greens and sparingly spontaneous on sea-beaches of the middle Californian coast.

Locs.—Pacific Grove, *Heller* 6275; Marin and Alameda cos. (Greene, Fl. Fr. 240); Fort Point and s. San Francisco (Zoe, 2: 352).

Refs.—TETRAGONIA EXPANSA Murr. in Comm. Goetting, 6: 13, t. 5 (1783); Pax in Engler & Prantl, Nat. Pflzfam. 3^b: 45, fig. 18 (1889).

6. **MESEMBRYANTHEMUM** L. FIG MARIGOLD.

Ours herbs. Stems and leaves very succulent, without stipules. Flowers axillary and terminal. Calyx-tube adnate to the ovary, the lobes unequal and foliaceous. Petals linear, very numerous, inserted with the innumerable stamens on the tube of the calyx. Ovary 5 to 12-celled, the styles as many as the cells of the ovary and distinct or nearly so. Capsule becoming baccate, dehiscing in rainy weather by stellate valves at the flattened summit. Seeds minute, numerous. (Greek *mesembria*, mid-day, and *antheon*, blossom.)

The 300 species of *Mesembryanthemum* are chiefly natives of South Africa, with a few in the Mediterranean region and in Australia. *M. nodiflorum*, *M. crystallinum* and *M. aequilaterale* seem out of place on the California coast and their status as native elements of our flora has been questioned. The balance of evidence as presented by Parish (The Californian *Mesembryanthemums*, *Zoe*, 1: 261) and by Greene (*Pitt.* 1: 82) is, however, strongly in favor of regarding them as indigenous plants, and these species are here so listed. The remaining species reported from California are, on the other hand, plainly adventitious or escapes from gardens. *M. CORDIFOLIUM* L. f. has the upper leaves petioled and cordate, and the flowers red. It has been cultivated in California for forty-five years or more, under the name of Dew Plant, and is an occasional escape from gardens (*Zoe*, 2: 352). *M. PUGIONIFORME* L. is a more recent arrival; stems from a thick perennial root; leaves linear-triquetrous, 2 to 5 inches long, mostly alternate but crowded in a basal tuft and towards the ends of the branchlets; calyx bowl-shaped, with caudate lobes, 7 to 10 or in fruit 10 to 14 lines broad.—Sparingly adventitious (Cliff House sand-dunes, San Francisco, *Hall* 4810; Pacific Grove, *Heller* 6717).

Annual; leaves alternate; herbage covered with shining vesicles; ovary 5-celled.

Leaves linear, semiterete 1. *M. nodiflorum*.

Leaves ovate to spatulate, flat 2. *M. crystallinum*.

Perennial; leaves opposite, thick, dorsally carinate; herbage smooth; ovary 10 to 12-celled, ... 3. *M. aequilaterale*.

1. ***M. nodiflorum*** L. Stems several from the base, prostrate or ascending; herbage covered with fine vesicles; leaves linear, 4 to 8 lines long, $\frac{1}{2}$ to 1 line wide; flowers solitary in the axils, subsessile or shortly peduncled; petals white, minute, much shorter than the calyx-lobes.

Southern California coast.

Locs.—San Juan, Orange Co., *Abrams* 3280; Lakeside, *Parish* 4428; San Diego, *Orcutt* 333; Santa Catalina Isl. acc. *Davidson* (*Erythraea*, 1: 59).

Ref.—*MESEMBRYANTHEMUM NODIFLORUM* L. Sp. Pl. 480 (1753), type loc. Egypt.

2. ***M. crystallinum*** L. ICE-PLANT. Stems repeatedly and rather shortly forked, 1 to 2 feet long; herbage covered with crystalline-dewy vesicles; leaves broadly ovate to broadly spatulate, $\frac{3}{4}$ to $1\frac{1}{2}$ inches long, narrowed to a short amplexicaul base, the lowest 2 to 5 inches long and nearly as broad and with a subcordate petioled base; calyx campanulate, 4 to 6 lines long; petals reddish, varying to white; ovary 5-celled.

Coast from Santa Barbara Co. south to San Diego. Lower California.

Locs.—Santa Monica, *Hall* 3277; Westminster, *Byram*; Coronado, *Hall* 3945; Santa Cruz Isl. (Greene, *Bull. Cal. Acad.* 2: 399); Mohave Desert, *K. Brandegee* (*Zoe*, 1: 263).

Ref.—*MESEMBRYANTHEMUM CRYSTALLINUM* L. Sp. Pl. 480 (1753), type loc. ? Africa.

3. ***M. aequilaterale*** Haw. SEA FIG. Stems several feet long, the plants forming extensive mats; leaves 3-sided, with nearly flat faces, thicker than broad, $1\frac{1}{2}$ to 2 inches long; flowers terminal, subsessile or shortly peduncled, fragrant and showy ($1\frac{1}{4}$ to 2 inches broad); petals bright rose-purple; ovary 9 to 12-celled.

Dunes and cliffs near the sea from Marin Co. southward to San Diego. In cultivation at Berkeley under the student name of "Faculty Onions." Also called "Beach-Strawberry."

Locs.—San Francisco; Ano Nuevo Pt., *Jepson*; San Luis Obispo (called "Beach-Apple"); Santa Cruz Isl. (Greene, *Bull. Cal. Acad.* 2: 399); San Miguel Isl. (Greene, *Pitt.* 1: 88).

Ref.—*MESEMBRYANTHEMUM AEQUILATERALE* Haw. Misc. Nat. 77 (1803), type Australasian.

PORTULACACEAE. PURSLANE FAMILY.

Ours low herbs with succulent entire leaves and regular perfect flowers. Calyx chorisepalous (synsepalous and superior in Portulaca). Sepals 2 (or in *Lewisia* 2 to 8), fewer than the petals. Petals commonly 5 (3 to 16), opening only in sunshine, withering quickly. Stamens 3 to 20, sometimes more numerous, opposite the petals when of the same number. Ovary 1-celled, commonly superior; styles 2 to 8, united below or distinct, stigmatic along the inside. Fruit a capsule, dehiscent from the apex by 2 or 3 valves, or circumscissile and the top falling away as a lid.—About 140 species in 16 genera, all continents but mostly America.

Bibliog.—Gray, A., *Portulacaceae* [of N. Am.], (Proc. Am. Acad. 22: 272-285,—1887). Brandegee, K., *Studies in Portulacaceae* (Proc. Cal. Acad. ser. 2, 4: 86-91,—1894). Howell, Thos., *Rearrangement of Am. Portulacaceae* (*Erythraea*, 1: 29-41,—1893).

Capsule 2 to 3-valved; sepals 2, distinct and free from the ovary, persistent.

Style 1, stigmas 2; flowers mostly in scorpioid spikes; capsule 2-valved; sepals plane, scarious or scarious-margined.....1. CALYPTRIDUM.

Style-branches 3; sepals more or less concave.

Flowers in leafy racemes or in panicles; petals commonly red, showy; stamens mostly 5 or more; seed numerous; annuals.....2. CALANDRINIA.

Flowers in naked or merely bracteate racemes; petals commonly white or pinkish; seeds few (3 to 6).

Stems from mostly fibrous roots; stamens 5 (or 3); annuals, or perennials by rhizomes or stolons.....3. MONTIA.

Stems from thick roots or corms; stamens 5.....4. CLAYTONIA.

Capsule circumscissile; stamens few to numerous.

Sepals 2 to 8, distinct and free from the ovary, persistent.....5. LEWISIA.

Sepals 2, united below and partly adherent to the ovary, the free upper portion deciduous... 6. PORTULACA.

1. CALYPTRIDUM Nutt.

Herbs with alternate or basal spatulate leaves. Flowers small, in panicles or mostly in solitary or clustered scorpioid spikes. Sepals 2, scarious or scarious-margined, orbicular. Petals 2 to 4. Stamens 1, 2, or 3. Style simple; stigmas 2. Capsule membranous, 2-valved, few to many-seeded.—Species 6, western North America. (Greek kaluptra, a calyptra, the petals closing over each other and carried up on the capsule.)

Style very short, this and the 1, 2, or 3 stamens included; capsule 5 to 20-seeded.—Subgenus EUCALYPTRIDUM.

Spikes not scorpioid, borne in a panicle; petals 3 (or 2); stamen 1; capsule 3 to 4 times length of fruiting calyx.....1. *C. monandrum*.

Spikes scorpioid, sometimes very short; capsule little or not at all surpassing fruiting calyx.

Petals 2; stamen 1.....2. *C. roseum*.

Petals 4; stamens in same species 1, 2, or 3.

Sepals not emarginate or reniform at base; Southern California....3. *C. parryi*.

Sepals round-reniform; Clear Lake region.....4. *C. quadripetalum*.

Style long, filiform, this and the 3 stamens exserted; capsule few-seeded.—Subgenus SPRAEGUEA.

Spikes borne in an umbel or capitate-congested at summit of the scape-like stems..... 5. *C. umbellatum*.

1. *C. monandrum* Nutt. Annual; stems several from the base, spreading or prostrate, 1 or 4 to 9 inches long; leaves mostly in a basal rosette, some scattered along the stem, linear-spatulate, $\frac{3}{4}$ to 2 (or 3) inches long; flowers in short spikes in a terminal panicle; panicle 1 to 6 inches long; sepals 1 line long, little accrescent; petals commonly 3; capsule linear, compressed, becoming much exserted, 3 to 4 lines long, more or less curved on dehiscence, 5 to 10-seeded.

Monterey Co. south to San Diego, east to the Colorado and Mohave deserts and north to Kern and Inyo cos. Arizona.

Locs.—Nacimiento River, *Eastwood*; Hernandez, *Eastwood*; Ft. Tejon, acc. *Greene* (Fl. Fr. 181); N. Fork Kern River, *Purpus* 5720; Argus Peak, *Hall & Chandler* 6900; Barstow, *Jepson* 5379; Pampa, Kern Co., *Heller* 7641; Coachella, *Hall* 5811; Carrizo Creek, *T. Brandegee*;

Vandeventer, San Jacinto Mts., *Jepson* 1425; Cuyamaca, *T. Brandegee*; Del Mar, *K. Brandegee*; San Bernardino, *Parish* 4187; Santa Inez Mts., *Dunn*; Santa Cruz Isl., *Brandegee*.

Ref.—*CALYPTRIDUM MONANDRUM* Nutt.; *T. & G. Fl.* 1: 198 (1838), type loc. San Diego, *Nuttall*.

2. *C. roseum* Wats. Annual; stems several from the base, decumbent, 1 to 3 lines long; leaves oblong-spatulate, 3 to 8 lines long, the basal ones few; flowers in very short scorpioid spikes; sepals orbicular-reniform, very shortly acute, green herbaceous with scarious margins, 1 to $1\frac{1}{2}$ lines long; petals 2, minute; stamen 1; capsule not exceeding the calyx, 6 to 12-seeded.

Attributed to Telescope Peak, Panamint Range, by Coville with some doubt. Western Nevada to Oregon and Wyoming.

Loes. in Nev.—Miller Mt., Esmeralda Co., *Shockley* 666; Eagle Valley, Ormsby Co., *C. F. Baker* 1027.

Refs.—*CALYPTRIDUM ROSEUM* Wats. Bot. King, 44, pl. 6, fig. 6-8 (1871), type loc. Truckee and Monitor valleys, Nev.; *Cov. Contrib. U. S. Nat. Herb.* 4: 73 (1893).

3. *C. parryi* Gray. Annual; stems several from the base, prostrate, 3 to 6 inches long; leaves spatulate, 4 to 8 lines long; spikes in age secund and scorpioid, 4 to 12 lines long; fruiting sepals orbicular or oval, herbaceous but white-margined, 1 to 2 lines long, a little shorter than the oblong capsule; style one-half length of the ovary; capsule valves minutely notched at summit.

San Bernardino and San Jacinto mountains, 6500 to 9300 ft.

Loes.—Bear Valley, *Parish* 3081; head of Willow Creek on trail to Round Valley, *Wilder* 942.

Ref.—*CALYPTRIDUM PARRYI* Gray, *Proc. Am. Acad.* 22: 285 (1887), type loc. Bear Valley, *Parry, Parish*.

4. *C. quadripetalum* Wats. Annual; stems many, erect or spreading from a decumbent base, 2 to 4 (or 9) inches long; leaves basal and cauline, oblong-spatulate, 1 to 2 inches long including the tapering petiole; spikes dense, 3 to 8 lines long, terminating the leafy branches; sepals round-reniform, white-scarious and rose-tinged with greenish center, 2 to 4 lines broad, exceeding the 4 petals; capsule oblong-oval, 10 to 20-seeded, little or not at all surpassing the fruiting calyx.

North Coast Ranges in the region of Clear Lake. June.

Loes.—Geysers, Sonoma Co., acc. *Greene* (*Fl. Fr.* 182); Lake Co., *Towle, Simonds*; Kelsey, *K. Brandegee*; Allens Sprs., *Cleveland*; Snow Mt., *T. Brandegee*.

Ref.—*CALYPTRIDUM QUADRIPETALUM* Wats. *Proc. Am. Acad.* 20: 356 (1885), type loc. Snow's Ranch, headwaters of Eel River in Lake Co., *Rattan*.

5. *C. umbellatum* Greene. PUSSY PAWS. Annual, biennial or perennial; stems several, erect or ascending, scape-like, 3 to 15 inches high, arising from a dense rosette of leaves; basal leaves spatulate, 1 to 2 (or 4) inches long, the cauline leaves few and similar, or mostly reduced, or none; flowers imbricate-crowded in scorpioid spikes; spikes borne in a terminal umbel or whorl, 3 to 6 lines long, on peduncles $\frac{1}{2}$ to 2 times as long; sepals orbicular, emarginate at base and apex, equal, wholly scarious or with a mere greenish center, dull white or often pink, in age 2 to 4 lines broad; petals 4, pink or white, obovate; stamens 3, each filament enfolded by a half-involute petal, the fourth petal embracing the style; stamens and the long style exserted; ovules 3 to 6 (or 10); capsule globose-ovate, 1 or 2-seeded; seed black, shining, microscopically tessellate.

Fine gravelly or sandy soil, common in open places in the mountains, on plateaus, slopes, valley floors, or washes, 2500 or 4000 to 8000 feet: Sierra Nevada and Coast Ranges. North to British Columbia, east to Nevada and the northern Rocky Mts. June-Sept.

Loes.—Santa Cruz, *Anderson* (only known station in South Coast Ranges); South Yollo Bolly, *Jepson*; Trinity Summit, *Jepson* 2040; Shackelford Cañon, w. Siskiyou, *Jepson* 2816; Egg Lake, Modoc Co., *M. S. Baker*; Plumas Co., *Platt*; Truckee, *Sonne*; Bear Valley, Nevada Co., *Jepson*; upper Stanislaus River, *Greene*; Yosemite, *Torrey* in 1865, *Jepson* 4259; Marble Fork Kaweah River, *Jepson* 659; Mt. Silliman, *Jepson* 723; Bubbs Creek, *Jepson* 837; Horse-shoe Mdw. near Mt. Whitney, *Jepson* 931.

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